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Abstract

The growing environmental, health and ethical concerns associated with chemical-intensive and genetically modified food and agriculture have enhanced the importance of sustainable agriculture. This paper addresses the market failure associated with conventional and sustainable agriculture. Data on several indicators reflect that Australia is lagging behind many European countries in developing sustainable agriculture. This paper argues that Australia should reposition and promote itself as an 'eco-nation' with a strong emphasis on sustainable technologies. This paper also proposes several policies relevant for Australia in increasing production, consumption and trade in this growth sector.

JEL Classification Code: Q01, Q17, Q28 and O13.

Key Words: sustainable, agriculture, trade, subsidies, market failure, eco-taxes

Deleted: Sustainable

Introduction

Ecologically sustainable agriculture better integrates environmental health, economic profits and socio-economic equity. Emphasis is placed on environmentally friendly production practices without use of artificial chemicals, fertilisers and pesticides and with a focus on ecological sustainability and ethical aspects of production. Many definitions of sustainable agriculture have been proposed. The American Society of Agronomy defines sustainable agriculture as 'one that, over the long term, enhances environmental quality and the resource base on which agriculture depends, provides for basic human food and fibre needs; is economically viable and enhances quality of life for farmers and society as a whole' (see Freyenberger et al. 2001, pp. 32). Several related terminologies with some variation include agro-ecology, natural farming, regenerative agriculture and others. In Austria, sustainable agriculture was declared to mean organic agriculture. In Nordic countries, ecological agriculture is equivalent to organic farming. Consumers and governments worldwide are now increasingly taking a serious look at the issues of food safety, environment and trade. However, the market for ecologically sustainable agricultural products is characterised by cases of market failure (Soil Association 2001). Consumers are not spending significant amount on organic products because these are expensive, at times twice or more the price of conventional produce. It is argued that majority of costs are internalised in organic production process. Under the assumption of perfectly competitive agricultural markets, the price closely reflects the 'true cost' of production to the society. Conventional chemical intensive agriculture externalises most of the costs. The relatively low price of conventional produce in the market does not reflect the

ecological and other social costs. Consumers, in fact, pay for the produce through three channels; the market price; taxes to provide for the subsidies for conventional farming (especially in Europe and the USA); and taxes to provide for clean up costs associated with pollution from conventional farming (Soil Association 2001). The governments of many countries show lack of initiative to address long-term health and environment issues of agricultural technologies. The focus of government and producers is primarily on short-term cost reduction and trade competitiveness. This paper addresses the growth and importance of environmentally sustainable agriculture and the policies relevant for Australia in the global market.

Market for Chemical-intensive Agriculture

The environmental and health concerns associated with chemical-intensive conventional farming have enhanced the importance of sustainable production techniques and ethical trade. Recent livestock diseases have influenced public opinion in favour of natural foods (MacKenzie 2000). The environmental and health consequences of conventional and 'factory farming' agriculture are substantial and often intangible. A study has shown that the total 'indirect' private and external costs of the use of synthetic pesticides in the USA were US$8.1 billion annually and US$5 billion of that were environmental and health costs Food and Agriculture Organization (FAO) 1997). Pretty et al. (2000) estimated the total hidden or external costs of non-organic farming to the environment and health in the UK at £2.34 billion (A$6.85 billion) or £203 (A$595) per hectare based on 1996 data. The total cost of removing pesticides from the water supply in the UK is £120 million (A$352 million) per year (see Soil Association 2001; Pretty 1997; Pretty 2001). The Environment Protection Agency (EPA) in the USA considers 60 percent of all herbicides, 90 percent of all fungicides, and 30 percent of all insecticides to be carcinogenic (Marshall 2001). The uncontrolled use of antibiotics and growth hormones seem to have resulted in numerous health problems in animals and humans (see eg, Este 2000; Mellon et al. 2001). The negative production externalities (environment pollution etc) and negative consumption externalities (long-term health effects etc) in conventional agriculture is illustrated in the Figure 1.

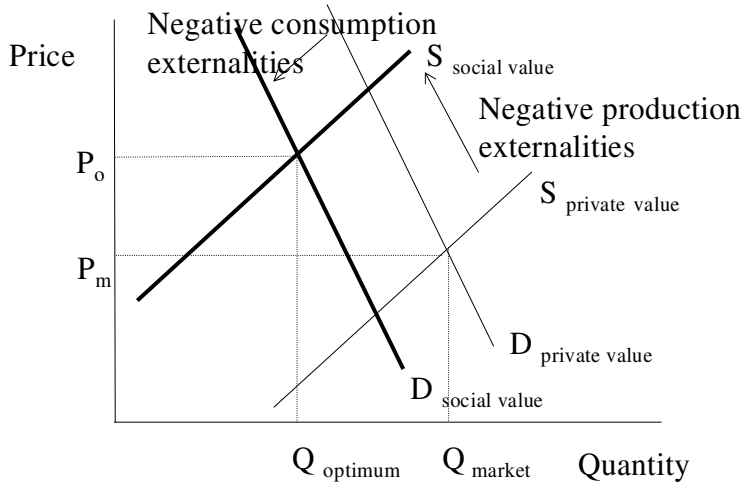

Figure 1: Market for Chemical-intensive Agriculture Produce

The Genetically Modified (GM) food market can be viewed as a market with known and unknown externalities. The long term risks associated with GM foods are unknown (Biodemocracy News 2001; Rissler & Mellon 1996). The genetic manipulations in GM techniques differ from traditional techniques of cross-breeding and hybridisation that are achieved over a longer time frame and with a high safety record. Research by Professor Arpad Pusztai has shown that laboratory rats fed GM potatoes spliced with lectin suffered damage to internal organs (see eg, Biodemocracy News, 2001). Though others have contested the results of the above research, there seems to be no research studies to establish long term safety of GM foods. Safety concerns in Germany led to the creation of a new ministry of food, agriculture, and consumer protection in January, 2001 headed by the Green Party which wanted to direct agriculture 'back to nature'. German Foreign Minister, Joschka Fisher stated that 'Europeans do not want genetically modified food-period. It does not matter what research shows, they just do not want it and that has to be respected' (Rural Migration News 2001, pp. 1). About 72 percent of GM foods are produced in the USA, Australia, with 0.1 million hectares under GM crops, ranks fifth in the production of GM crops (Foster 2001; Halweil 2000).

The year 2000 saw significant consumer protest and legal actions against several GM foods (see Biodemocracy News 2001). Transferring unrelated genes from animals into plants raises important ethical issues for religious groups and vegetarians. Consumers across the world have shown strong resentment to GM foods (see also, Australian New Zealand Food Authority (ANZFA) 2000). For instance, contamination associated with a GM corn has caused significant damage to the corn farmers in the USA. Losing GM free status has damaged American corn exports to markets in Japan, Hong Kong and Korea. With regard to soybean, the non-GM status of Australia has been identified 'as a possible advantage over other soybean producers, such as the USA, which has more than half its soybean crop sown to GM varieties.' (American Corn Growers Association 2001). GM crops also pose a threat to sustainable agriculture through, *inter alia*, cross contamination and creation of pests resistant to natural Bacillus thuringiensis (Bt) toxins by splicing Bt genes into GM crops (Crouch 1995; Hawken, Lovins & Lovins 1999; Hindmarsh 2000). Many governments are slow to react to public opinion. The legislation on control of chemicals, food labelling and long term safety issues of GM products in many countries is inadequate (see Mellon et al. 2001; Union of Concerned Scientists 2002; Villar 2001).

Market for Sustainable Agriculture in Australia and the World

Several reasons are cited in favour of organic foods (see eg, Marshall 2001). These include protection of future generations, preventing soil erosion, protecting water quality, saving energy, keeping dangerous chemicals off food, protecting the health of

farm workers, helping small farmers, promoting bio-diversity, and providing food with good nutrition and flavour. Increasing agricultural job opportunities together with maintaining a clean environment and healthy rural communities thus form the core issue of organic farming (see also, Kinnear 2000b; Walter 2002).

Although still a small proportion of production and trade in traditional agricultural and food products, sustainable farming and trade have grown in importance world wide in the past few years. The size and growth of agriculture production utilising organic production techniques varies significantly across countries. Australia has the largest area under organic farming in the world. However, most of this area is utilised as low-intensity grazing land used especially for the production of cattle (Willer & Yussefi 2001). The cattle raised in this area are known to consume about 100 different native shrubs, grasses, and herbs. They are free from any food additives or growth hormones and glow in good health. This is a strong positive factor in the international market and Australian organic beef commands a premium price in Japan. Similarly the demand for Australian organic rice outweighs the supply in the international market (see eg, Institute of Horticultural Development 1998). Despite these success stories, Australian organic agriculture lags far behind that of many Organisation for Economic Cooperation and Development (OECD) countries. This can be seen from a variety of indicators, such as i) percentage of the area under organic agriculture, ii) market size and consumer attitudes, iii) government subsidies and eco-taxes and iv) public and private research in sustainable agriculture. For practical reasons, we use the available statistics on organic agriculture which form the core of broad based sustainable agricultural programs.

Area under organic agriculture

Figure 2 illustrates the percentage of agricultural area under organic agriculture in selected OECD countries. Although Australia has the largest area under organic agriculture, most of this as we have noted is in the form of low-intensity grazing land. Sometimes some of this land collapses under drought conditions making it unsuitable for animal husbandry. Thus area under organic agriculture may not be internationally comparable. A better and internationally comparable indicator is the percentage of area of agriculture land under organic agriculture. Several European countries are taking the lead in achieving a higher percentage of agriculture under organic production. The area under organic agriculture in Australia at 1.6 percent falls below the OECD average of 2.4 (Willer & Yussefi 2001).

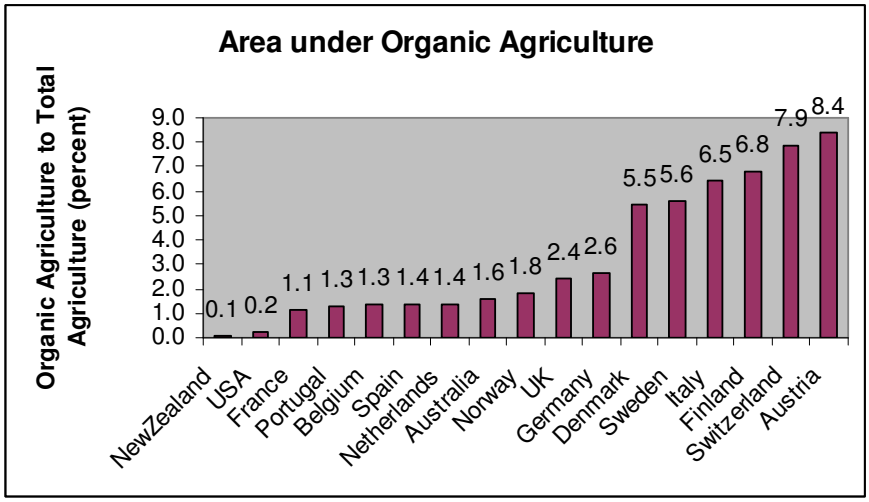

Figure 2: Area under Organic Agriculture

Source: Willer and Yussefi (2001)

Market size and consumer attitudes

The market size and consumer attitudes towards organic food reflect that Australia lags behind those in OECD markets. Figure 3 shows that per capita spending on organic food in Australia is one of the lowest at US$ 9.2 (A$18), in comparison with selected OECD countries. Per capita spending in New Zealand is 67 percent higher than that of Australia (Willer & Yussefi 2001). One suggested explanation is based on the vast land resource in Australia. It is argued that many Australian families, especially those in rural and sub-urban areas, have large backyards in which they grow a variety of fruits and vegetables without chemicals for own consumption. However, a large proportion of Australians live in urban areas and do not have enough land for growing produce. Also, data on household and non-market production of agricultural products is not available for further analysis. A second explanation for the low spending is based on the consumers' belief that Australian agricultural products grown in conventional methods are safe and less chemically intensive than those from other OECD countries. Though Australian produce at present is relatively safer in terms of genetic modification as compared with American products, the use of organo-phosphates, pesticides and growth hormones in conventional farming in Australia is as high as those in other OECD countries (Este 2000). Consumers in northern Europe (barring the UK) are exhibiting greater awareness of the health and environmental benefits of sustainable agriculture by revealing their preference for eco-friendly products.

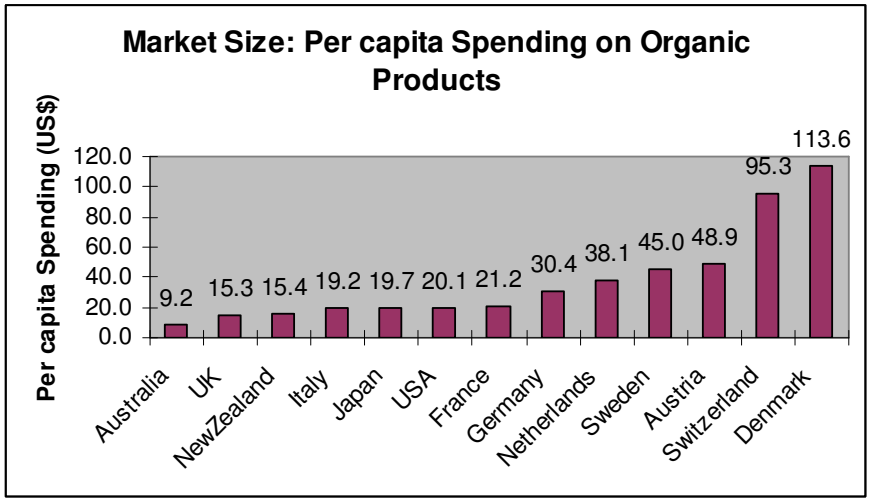

Figure 3: Market Size: Per capita Spending on Organic Products

Source: Willer and Yussefi (2001)

Even in the small Australian market, a significant proportion of supply is catered for by imports. This is because the Australian organic sector is concentrated in a few products only. These include mainly beef, wine, cereal and selected fruits and vegetables. The export market is roughly one-third of the size of the domestic market. While the producers of conventional agricultural products are effectively targeting export markets, the export performance of the Australian organic sector lags behind that of many countries, including neighbouring New Zealand. Australia 'does not seem to have targeted export markets as aggressively as NZ and, therefore, not realised its potential for organic exports' (Saunders et al. 2001). A large and strong domestic market also provides a cushion for any uncertainties associated with export markets.

Government subsidies and eco-taxes

Many OECD governments, notably Denmark, take a pro-active approach in support of sustainable agriculture. Realising positive externalities in the form of environment and health, support for organic agriculture is included in the broad agri-environment policies. A number of countries have set targets and action plans for organic agriculture. Denmark is aiming to become 100 percent organic over 10 years. Sweden plans to be 25 percent organic by 2005. Germany is planning to have 20 percent of production under organic methods by 2010. Under current growth rates, the European Union (EU) is expected to have 30 percent of agricultural area under organic farming by 2010 (Halweil 2001). Such targets are difficult to achieve without government support in the form of tax incentives, subsidies and research funding in organic methods. The difficulty in conversion from conventional to organic production varies for different products, with conversion for wine relatively easy and that for rices being the most difficult (O'Riordan & Cobb 2001; Willer & Yussefi 2001). As the conversion process takes two or more years, the incomes of farmers also decrease

during conversion. Thus financial incentives are very important in the growth of sustainable agriculture.

Subsidies for organic agriculture vary widely across EU countries. Uniform and internationally comparable data on subsidies is not available for many countries. Subsidies vary across countries and across the products. Fruit and vegetables in general attract more subsidies across EU countries than grains and dairy production. Austria provides conversion subsidies ranging from 727 Euro (A$1,316) per hectare for fruit and vegetable production down to 218 Euro (A$395) per hectare for grasslands. The corresponding figures for Belgium are 744 Euro and 112 Euro respectively. France offers 717 Euro per hectare for citrus production and 107 Euro per hectare for permanent grasslands. France and the UK offer only conversion subsidies while Denmark, Ireland, and Spain offer both conversion and on-going subsidies at different rates. Subsidies are considered more important than premium market prices in Switzerland. But in Italy, subsidies are not considered important mainly because farmers consider the time and cost of applying for subsidies to outweigh the benefits. Only 50 percent of farmers in Italy have taken advantage of the subsidies while the rest would like to rely on premium prices. Within countries, there is also variation in assistance levels between regions. For instance, a region within Italy, Emilia-Romagna, introduced new payments under which farmers undertaking organic animal husbandry can receive a maximum payment of 450 Euro per hectare of forage (see www.organic-europe.net/country_reports for detailed country subsidies).
Many European countries have also introduced ecologically-driven taxes to encourage sustainable agriculture and rural development (OECD 1996). Since 2000, organic farms in the Netherlands are eligible for tax concessions as 'green' investments. Italy imposes a tax on synthetic pesticides and utilises the revenue for advertising campaigns promoting organic food (see Archer & Shogun 2001; Koskele, Sinn & Schob 2001; Lawn, 2000; Liddament & Backhaus 1999). Government support for organic agriculture in the form of subsidies or tax incentives in Australia is very minimal (Kinnear 2000b).

Research in sustainable agriculture

There has been a significant change in the direction and support of research into sustainable agriculture. In the 1970s, the focus of research was to show that organic agriculture was financially viable (Wynen & Vanzetti 1999). In 1980, the emphasis shifted to applied research focussing on the short-run production problems in organic agriculture such as soil, crop rotation issues etc (Wynen & Vanzetti 1999). Current research in sustainable agriculture focuses on wider community issues and priorities including areas such as energy, natural resource management, food quality and nutrition, animal protection and health, agriculture ecology, biodiversity, social and environmental consequences of agricultural technologies (see Alroe & Kristensen 2002; FAO 1997). Data on organic research expenditures is difficult to obtain. Different countries have different systems of funding, some involving funding from the national government while other countries have research funds from state or local governments. Figure 4 summarises government research support for selected countries for 1997 (Wynen & Vanzetti 1999). These data should be considered suggestive and should be interpreted with caution. Wynen and Vanzetti have

calculated these ratios assuming that 2 percent of agricultural expenditure is devoted to agricultural research.

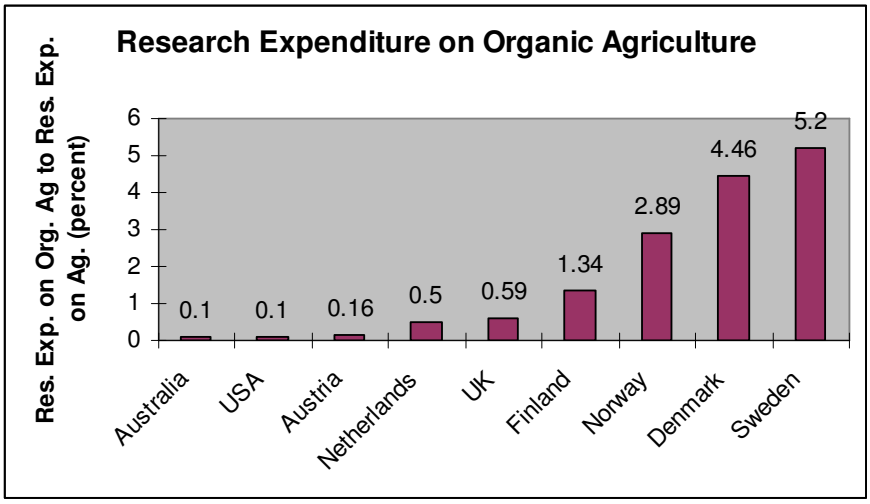

Figure 4: Research Expenditure on Organic Agriculture

Source: Wynen and Vanzetti (1999)

Nordic countries take a leading role in public funding for research into sustainable agriculture. In Denmark, Finland, Norway and Sweden, 400 research projects relating to organic farming are currently being carried out (Niggli 1999). Universities in European countries also have taken a leading role in sustainable agriculture. Germany was the first to establish a Professorial Chair in organic agriculture in 1981 and established a second Chair in 1987. The Scottish University of Aberdeen, for instance, offers degree programs in sustainable agriculture. Australia is at the bottom level in terms of public research support (Rural Industries Research and Development Corporation (RIRDC) 2000).

Private and semi-private research organisations and institutions also contribute to research in sustainable agriculture. Private research institutes are more prominent in the Netherlands, UK, and Switzerland. Research undertaken at the university level is significant in Germany, Austria, Italy, Sweden and also the Netherlands. State research institutes are important in Finland, Denmark, Norway, Sweden and the UK. Research is insufficiently funded in Italy, Belgium and Spain. The US organic sector is characterised by government neglect (Lohr & Salomonsson 2000). Private and semi-private research funding and initiatives in Australia are minimal and inadequate. An example can be seen in Landcare (Curtis & De Lacy 1998). However, the focus of Landcare on sustainable production technologies is inadequate.

Research support in EU is likely to increase significantly since the adoption of the Common Agricultural Policy (CAP) reform, *Agenda 2000*, which puts high emphasis on environmentally friendly agricultural practices and provides for financial means to promote rural development and environment (Givord 1999; Lampkin 1999). While

the organic industry in Australia received $1 million, the Federal and Queensland Governments announced funding of $520 million in support of bioindustry research (which includes GM products) in 2000 (Donaghy & Rolfe 2001; Kinnear 2000a).

Trade Prospects and Policy Challenges

The worldwide market for organic products is expected to grow over 20 percent per annum, with strong growth coming from Australia's major trading partners (Willer & Yussefi 2001). Many EU countries have high population densities and scarcity of land. This constrains their expansion of the organic sector despite a strong will. Australia has a comparative advantage in sustainable agricultural produce with its large land area and low population base. Several policies can be suggested. Firstly, the government should accord a high priority to sustainable agricultural practices and allocate significant funds for basic and applied research, education and conversion subsidies. The current financial and other aid (eg, research) to conventional farming should be gradually shifted to sustainable agriculture. This will encourage farmers to switch to sustainable methods. Funding should also be allocated in such a way that it encourages a wide range of products to be brought under sustainable agriculture. Secondly, government should take an extremely cautious approach to the consequences of GM agriculture based on experience in the US and Europe and introduce legislation for GM labelling and ensuring that GM crops do not contaminate native organic crops. New Zealand, for example, imposed a moratorium on all GM trials until the investigation of a Royal Commission is complete. This has enabled its farmers to capture the markets lost by Australia (Acres Australia 2001). Australia should also introduce a moratorium on further increases in GM crop areas until the long term safety of these crops and the issues of threat to organic farming are thoroughly researched. The principle of 'substantial equivalence' of GM foods should not be considered as an indicator of safety of these foods. Thirdly, eco-taxes should be introduced on pesticide and chemical use, as in several EU countries, to make the polluters pay. The price of conventional produce would then be closer to the true cost and a level playing field would be created for the development of environmentally healthy agricultural practices. Appropriate tax concessions should be accorded for green investments, which also include organic production. Fourthly, new legislation encouraging ethical production processes, enhanced animal health and protection and encouraging rural stewardship should be considered. For instance, given its large land space, Australia could abolish factory-farming methods like battery poultry and others by offering suitable financial assistance to producers for conversion to ethical production processes. This will address the concern of 'ethical consumers' whose proportion is expected to grow significantly worldwide (Browne et al. 2000; Rolfe 1999). Increased awareness of free trade versus fair trade issues encourages ethical consumers to pay premium prices for products produced under ethical and sustainable processes. Finally, the organic industry should be involved in educating the public on the health and environmental benefits of organic food through media and campaigns and encouraging the public to switch to organic products. Australian consumers need to play a critical role so that environmental quality, nutritional value and equity issues are considered in shopping decisions. Policy recommendations 1, 3 and 4 address mainly 'supply side' while recommendation 5 specifically addresses the 'demand side'. Recommendation 2 addresses both demand and supply sides associated with GM produce.

It should be noted that a lack of stringent regulations in large countries like the US puts pressure on Australia to follow a minimal regulation approach. This is referred to as a 'race-to-the-bottom' in the regulatory framework: governments are under pressure to deregulate and lower their environmental standards in order to stay competitive in the global economy (Esty & Geradin 1998). However, increasing consumer awareness can counter this phenomenon if consumers are able to distinguish the quality differences and long term health and environmental benefits. Governments should take a long-term approach to agriculture, trade and environment (Herstgaard 2000; Wood et al. 2000). The major markets of Australian agricultural products are in nations of the Asia-Pacific region which are sensitive to cultural, environmental and health issues relating to food. Aggressively cultivating an 'eco-nation' image with clean production technologies and natural healthy food production is of the utmost importance for Australia to achieve both ecological and trade benefits. Potential damage from uncontrolled conventional and GM oriented farming may cause export markets to collapse in the long run, as can be seen from the cases of the beef industry in the UK and the corn industry in the US.

Conclusion

Increasing global prosperity and social costs of 'race to the bottom' competitiveness in agriculture have brought environmental, health and food safety issues to the forefront. The present conventional farming with heavy dependence on chemicals and non-renewable resources is not sustainable worldwide. Environment and health concerns have led to a significant worldwide growth of organic markets, expected to reach A$150 billion by 2006 (Department of Primary Industries 2000). Though part of the land is dry and drought prone, Australia still has a natural comparative advantage in production of foods through sustainable and ethical agriculture technologies ranging across several product groups. However, data on a broad spectrum of organic agriculture indicators shows that Australia lags far behind other developed countries. The involvement of governments in Australia is inadequate in all dimensions associated with environmentally sustainable agriculture. If the current state of affairs continues, Australia's share of the world organic market will decrease, forming less than one percent. A long-term holistic approach based on sustainability that 'concerns land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable' (International Federation of Organic Agriculture Movement (IFOAM) 2000) should be adopted for agriculture. Governments should gradually transfer the existing funding from environmentally destructive agriculture production processes to environmentally friendly technologies. It is in the long-term interest of the country to develop broad-based agri-environmental policies in partnership between the public, farming community, research institutions and other interested parties and vigorously promote sustainable agriculture in the future. Future research can be directed at developing comprehensive modelling of eco-friendly agricultural markets, detailed studies of the cost of externalities associated with conventional and GM agriculture, the long term safety issues of GM food production in Australia, and quantifying the future domestic and export market impact of the health, ethical and long term safety issues.

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