Canola – Where to for WA Agriculture?

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Abstract

Canola may be marketed as oilseed, oil or meal. Supply and demand of each of the commodities is influenced by, physical factors associated with land and weather, substitute commodity competition, land-use competition, production indirectly associated with canola such as that within the livestock industry and the effects of technology and more specifically plant breeding. Furthermore, domestic agricultural and international trade policies, standard of living, and political stability of countries involved in the canola market together with exchange rates will also affect supply and demand for canola products. The implications of genetically modified canola also need to be understood along with each of the aforementioned factors and their relationship with each other to help predict the future for this crop. This paper provides such an overview and explains how Western Australia fits into the market.

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1. Introduction

Canola[1] is valued for its oil and feed components and was developed in Canada in the mid-1970's by modifying some key characteristics of the plant species *Brassica napus* and *Brassica campestris/rapa*. (CCC 2000a). Specifically, the oil component was modified to include less than 2 per cent erucic acid, and the meal component altered to include less than 30 micromoles per gram glucosinolates, thus making both the oil and meal components safe and of high food/feed value for consumption (CCC 2000a).

In Australia, canola was not grown in any significant amounts until the mid 1990's. While canola may be marketed as oilseed, oil or meal, currently edible oil is the primary product and meal is essentially a by-product[2]. The fact that this crop has two end products with different markets presents a more complicated scenario than is usual for producers. That is, the demand for oilseed is derived from the separate demand for canola oil (and its substitutes), and to a lesser extent, the demand for canola meal (and its substitutes). Hence, markets for both and the implications of each of these markets on the other need to be understood when making management decisions as to whether canola is a viable alternative crop.

Therefore, the fundamental driver of world canola demand is the growth in world markets for edible oils, with the main oils being soybean, palm, canola, and sunflower[3]. Demand for edible oils collectively will be determined mainly by population growth and by economic growth in income per head. Relative demand for individual edible oils also will depend on oil characteristics such as saturated or non-saturated fatty acids, levels of erucic acid, storability and shelf life, medicinal properties, and cooking qualities. Thus changes in tastes for any of these characteristics, and/or in the composition of particular oils will influence demand for individual edible oils.

[1] Throughout this text canola and rapeseed are interchanged but, unless stipulated otherwise, both refer to varieties that have erucic acid and glucosinolates levels as described in this paragraph.

[2] Although, with plant breeding to improve oilseed attributes and developments in processing technologies, meal will become a more valuable canola product.

[3] As an aside, world olive oil production in 1998 was roughly 20% of canola oil production and just under 30% of sunflower oil production (based on FAO, 2000 figures) so while important, olive oil is not a major vegetable oil.

Although not as significant a product as canola oil, canola meal and substitute meals should be considered when assessing canola demand. Canola meal demand has the potential to influence the market but more importantly demand for substitute meals and more specifically soymeal, can influence the oil market by causing an increase in supply. Demand for canola meal is largely determined by the level of expansion of the intensive livestock industry, price, quantity of substitute meals in the market place and amount of other protein feed products available.

Apart from the price that farmers receive for canola oilseed, other significant determinants of supply are whether whole farm production costs can be reduced by including it in crop rotations. That is, physical factors associated with land and weather, land-use competition and the effects of technology and more specifically plant breeding are all key considerations on the supply side. Furthermore, supply is also influenced by the costs associated with producing each edible oil compared to producing competing edible oils.

This paper looks at the supply of, and demand for canola and its derivatives as a basis for assessing future long-run price prospects for canola oilseed. Other ramifications for producers in Western Australia (WA) include, planned production by international competitors, domestic agricultural and international trade policies and political stability of countries involved in the canola market and exchange rate fluctuations and these are reviewed briefly. The influence of physical factors associated with land and weather, substitute commodity competition, land-use competition and exogenous factors, such as fluctuations in demand for livestock products that will influence the cost of production for WA farmers also are discussed.

The choice and suitability of canola varieties is vital for successful production. Currently, varieties available to Western Australian producers are not ideal, and factors such as disease and pest resistance, herbicide tolerance, yield and agronomic factors, and seed quality all need to be addressed if levels of canola production are to be sustained, let alone increased. These issues are addressed in this paper along with crop breeding and how to most successfully address the aforementioned factors.

Moreover, the implications for crop breeding of the new molecular technologies as well as the priorities for plant breeding arising from both prospective market conditions and technological change need to be understood. Genetically modified canola, although not yet commercially produced in WA, as well as varietal traits for which there may be niche markets, are also important considerations in setting priorities and strategies for a breeding programme. In addition to these concerns, this report deals with the implications of germplasm accessibility to plant breeding and the significant implications this will have on the future competitiveness of canola production in WA.

2. Demand for Canola

2.1 Demand for edible oils

Understanding demand for edible oil is important in terms of potential exports of both oilseed and oil from Western Australia. Together with sunflower oil, canola oil is a premium cooking oil. Lordkipanidze, Epperson, and Ames (1996) found that import demand for canola oil is influenced by the world oilseeds market, government programmes, exchange rates and policies including tariffs and subsidies. Furthermore, they concluded that consumer preference for canola oil as a healthy alternative also has a positive effect on market share.

What's more, Mielke and Mielke (1999) explain that the greatest population and income growth is expected in countries still developing and where their consumption of oil/fats and livestock products is relatively low. In analysing world GDP, the same authors conclude that since the 1970s the GDP growth rate for these developing countries has been consistently above those of developed countries and is expected to be so until 2020. Should this scenario be the case, then consumption of oil and related products should increase to levels perhaps not too different from those currently experienced in developed countries. Indian consumption of vegetable oil is perhaps an example of this trend with increases of 26 per cent in 1998/99 from the previous year (USDA 1999). Furthermore, Beckman (2000) believes Chinese demand for oilseeds, protein meal and vegetable oil will increase due to higher population, income growth, urbanisation and the emergence of a market-oriented economy.

As explained by CCC (2000a) canola oil is dominant in Japanese diets and is predominantly sourced from imported oilseed, crushed locally, rather than from imported oil. This scenario comes as a result of an import tariff in Japan on vegetable oils that prevents the import of any oil in significant quantities (CCC 2000a). Canola oil's penetration of Japan's domestic production of edible vegetable oils has continued to grow since the 1970's, primarily at the expense of oils other than soybean.

On a world scale, it is expected that within the next five years, income and population growth should encourage expansion in the world demand for oilseeds and related products (OECD 2000). Asia is expected to account for much of this increased demand and is likely to increase oilseed imports from Australia, Brazil and the United States (OECD 2000). Even so countries such as China and India could have fluctuating levels of demand depending on their import and domestic production policies (OECD 2000).

2.2 Substitute oil competition

In the international edible oil markets there is high substitutability of a wide range of oils and fats which means that the prices of these oils are not likely to diverge greatly from each other (In and Inder 1997). In and Inder (1997) identified general vegetable oils as soybean, cotton, rapeseed, sunflower and palm oil and found that there is cointegration or a long-run relationship between sunflower and soybean and sunflower and rapeseed and thus substitutability between them. Nevertheless, as sunflower and canola oil are close but imperfect substitutes factors such as distance from production, tariff barriers and market-specific preferences all affect demand (Johnson *et al*. 1996)

During the latter half of the 1990's on average 63 per cent[4] of oil and fat consumed in Australia was derived from the general oils. Of the general oils, canola oil contributed 34 per cent to the total and palm oil, 26 per cent. Sunflower and cottonseed oil made up about 15 per cent of the total and soybean oil, 8 per cent.

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[4] The figures quoted in this paragraph were derived using FAO (2000) data

The popularity of canola oil is partly due to its healthy dietary characteristics. Canola oil has only 7 per cent saturated fat[5], compared to sunflower oil with 12 per cent, soybean oil with 15 per cent and palm oil with 51 per cent CCC (2000b). Furthermore canola oil has a high level of monosaturated fatty acid and oleic acid[6], is a rich source of vitamin E and is a rich source of essential fatty acids (CCC 2000b).

Even so, palm oil will become the world's leading oil in about 2012 mainly due to its higher yield per hectare than any seed oil and low production costs (Mielke and Mielke 1999). If this is the case, it may significantly affect the market if the health advantages of canola oil are not a priority. So, if production of palm oil was to increase and price fall, demand for palm oil would increase and conversely if supply was tight, price would increase to an extent where consumers would move out of the palm oil market and into a substitute market such as soybean, canola or sunflower oil.

2.3 Canola Meal

The other identity of canola relates to the protein meal left when the oil is extracted from the seed. The meal is used in livestock, poultry and swine feeds. Based on nutrient content alone, canola meal is worth, on a unit weight basis, 65 to 70 per cent of the value of 44%-protein soybean meal for feeding poultry and about 70 to 75 per cent of the value of soybean meal for feeding swine and ruminants (CCC 2000a).

A major reason for the increased demand for canola in Japan has been due to improvements in the quality of the protein in canola meal (CCC 2000a). High erucic rapeseed meal was traditionally a fertilizer for Japanese tea, tobacco and citrus farms, however, canola meal allowed the Japanese industry to direct a large proportion of the production to the Japanese feed industry (CCC 2000a).

[5] Saturated fat tends to increase blood cholesterol (CCC, 2000b)

[6] both reduce blood cholesterols levels

If it is assumed that the world standard of living will improve and so consumption of animal products will increase then the future for increased demand for feed is bright. Such a situation is already arising with an increase in demand for protein meal due to the expansion of intensive livestock production in response to an increase in the per capita consumption of chicken and pork (Beckman 1999b). It is also thought that by the year 2005, poultry will be the leading meat consumed in OECD countries with developing countries expanding their demand for poultry and so demand for oilmeal will also increase (OECD 2000). Pothidee, Open, Allen and Hudson (1999) note that livestock operations have become larger and more specialised with fewer mixed enterprises resulting in producers being sensitive to variation in feed prices. In the short to medium term, the OECD (2000) expects that growth in world oilseed consumption will increase by about 4 per cent a year with this mainly due to lower feed cost in expanding markets such as the EU, China and the USA.

Moreover, to increase canola meal demand (and indirectly increase canola oilseed imports), Canada has been assisting China to help overcome over-heating the meal during processing thereby resulting in low prices for Chinese canola meal (Beckman 2000). To further increase canola meal demand, innovative initiatives are also in place such as collaborative research being conducted by the Canola Council of Canada and USDA whereby they are looking at canola meal as an alternative protein source in channel catfish feeds. They foresee canola as a partial or total substitute for more costly soybean meal and as feed accounts for 40 to 60 percent of aquaculture production costs there is potential for an expanded market for canola (USDA 2000b). Mielke and Mielke (1999) also discuss the potential of aquaculture becoming a significant player in the demand for meal products with demand increasing from 4 to 70 million tonnes in the last twenty years.

In North America canola meal is in competition primarily with soybean meal whereas in Australia, competition for canola meal comes from cottonseed meal and protein sources such as lupins, peas and beans. Furthermore, Beckman (1999a) expects that in Australia increased production of cottonseed and canola meals will reduce imports of soymeals but also notes that supply and price of cottonseed and canola meals must be reliable to successfully compete against imported soymeal. Even so, Beckman (1999a) does not expect Australia to export much canola meal due to its current deficit in protein meal.

It is not surprising then, that world protein meal prices are closely correlated to the price of soymeal which dominates the world protein market (Beckman, 1999b). Even so, as alluded to by Oleson and Beckman (1998), protein meal price is strongly linked to feed oilseed prices so if the demand for vegetable oil is high, a greater quantity of meal will be supplied and consequently meal in general may command a lower price.

3. Canola Supply

3.1 Major world canola producers

Together, India, China, the European Union[7], Canada and Australia produce around 90 per cent of the world's canola. While canola oilseed production from the mid-1980s to the mid-1990's increased steadily in Canada, China, India & the European Union, in Australia it was largely seen by farmers as a secondary crop that was difficult to grow. As a result production did not becoming significant until the 1990's (Figure 1) and by 1999, Australia was producing almost 5 per cent[8] of world canola output. Colton and Potter (1999) suggest that the increase in canola grown in Australia can be attributed to Canola Check[9], improved agronomy and better varieties, and more specifically the adoption of triazine tolerant canola. Furthermore, and looking towards the year 2005, the OECD (2000) expects that world oilseed production (includes rapeseed, soybeans and sunflowerseed) will increase by over 3 per cent per year.

While Beckman (2000) acknowledges that Chinese canola production will increase, it is constrained by a lack of arable land and slow growth in yields so increasing demand for oilseed imports. Moreover, China's accession to the World Trade Organisation will improve assess to China's markets for oilseeds and oilseed products although competition for Australian canola exports will come from Canada with the US and South America supplying soybeans.

[7] Any reference to the European Union refers to the group of 15 member countries.

[8] Based on FAO figures.

[9] An initiative whereby participating farmers monitor their crops and discuss production techniques with other farmers and researchers.

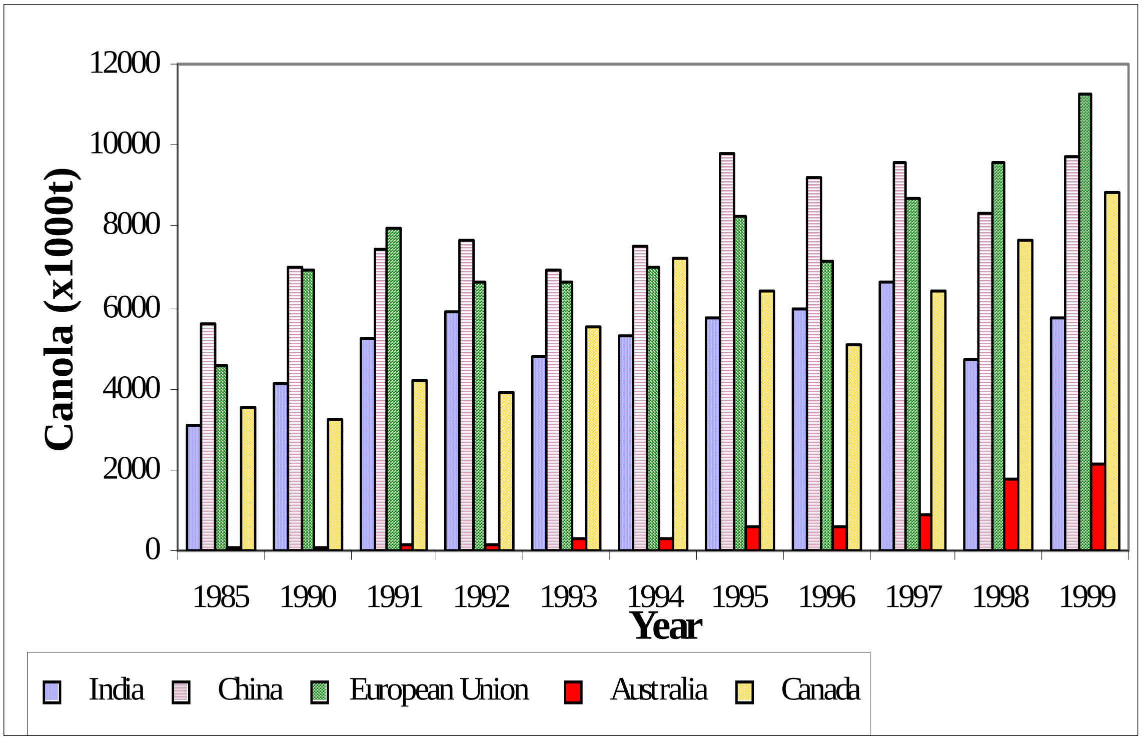

Figure 1. Canola production in India, China, European Union, Australia and Canada from 1985, 1990 to 1999 (Source: FAO, 2000)

3.2 Supply of Canola oil and meal

Canada is one of the world's major processors and exporters of canola oil sending much of its oil to the US but also to other countries where it competes with the EU for market share (Johnson, Satyanarayana, Dahl and Dooley 1996). Australia contributes little to the world canola oil supply producing only about 1.3[10] per cent of the total supply and according to Beckman (1999a) exports most of its canola oil to India and Vietnam. Furthermore, it is expected that the Australian canola crush will increase only marginally as demand is restricted by low domestic population growth, high world palm oil and soy oil supplies (and hence low prices) and reduced crush margins Beckman (1999a).

[10] Derived from FAO data

Nevertheless, Salisbury and Potter (1999) expect an increase in the export of value-added products rather than oilseed. Should this expectation arise there may be an increase in canola crushing in Western Australia or greater exports of canola oilseed to other Australian States for crushing. Even so, as discussed in Sections 5 and 7 below, the volume of value-added products that can be exported is, among other reasons, hampered by tariffs in place in many of the importing countries.

As soybean meal is the dominant source of protein in the livestock industry, production of soybean is largely driven by this market and not the oil market whereas meal production from crops such as canola and sunflower is more a reflection of the oil market (Mielke and Mielke 1999). Even so, Mielke and Mielke (1999) predict that livestock production will increase by 59 per cent by the year 2020 and consequently the industry will require a huge increase in feed. In addition, these same authors expect that rapeseed meal has the biggest growth potential in the group of 11 other oilmeals due to substantial increased canola production worldwide. With improved processing technology and plant breeding techniques, canola meal with more specific dietary requirements could also be produced.

3.3 West Australian Supply of Canola

Canola has adapted and can be grown successfully on a wide range of soil types (Potter, Marcroft, Walton and Parker 1999) although Walton, Mendham, Robertson and Potter (1999) acknowledge that compared with wheat, canola is less tolerant to water deficit and is sensitive to water logging resulting in yield reduction. Nevertheless, Western Australia has the capacity to increase production in terms of greater area of crop planted and improved yield. A development that will be largely due to plant breeders producing varieties with traits better suited to the State's conditions and growing seasons. Furthermore, canola is an important rotation crop in terms of assisting with weed control and acting as a disease break in cereals (Norton, Kirkegaard, Angus and Potter 1999).

In Western Australia, cereals such as wheat, oats and barley may be grown in rotation with either pasture or alternative winter crops such as canola, field peas and lupins. Using ABS (1999) figures, in 1998/99, the area of canola grown was nine per cent of the total area planted to grain and oilseed[11] in Western Australia (Table 1). In comparison, almost a quarter of the Canadian oilseed crop was planted to canola (Table 1). If Western Australia was to do likewise and increase land area allocated to canola to around 25 per cent, then current land area would increase by just over 2.5 times (Table 1). Potter *et al*. (1999) expect that the area planted to canola in Australia may increase by up to two-fold and this increase is likely in the lower rainfall areas. Moreover, Mielke and Mielke (1999) recognise that countries such as those in South America, Australia and the ex-USSR have the potential to increase production through use of land reserves.

Table 1. Area of grain and canola crops (x1000ha) and percentage of canola grown in Western Australia and Canada in 1998/99

	Western Australia[a]	**Canada[b]**
wheat	4 500	10 768
oats	228	1 592
barley	811	4 432
canola	536	5 428
total	6075	22 220
canola as a % of the total	9	24

a: Figures are either taken or derived from ABS (1999)

b: Figures are either taken or derived from FAO (2000)

The time horizon for this increase will depend on, if and when transgenic canola is introduced into Australia and on other developments in canola plant breeding such as improved resistance to disease. Furthermore, continued expansion will depend on the farming system and on the profitability of canola relative to other crops and land uses. Beckman (1999a) cites a reason for increasing canola production in Australia as being due to low returns from coarse grains, wheat and wool and also farmers' increased familiarity with growing canola. Even so the same author warns that should research overcome fungal root disease in wheat then canola production will be further pressured when canola prices fall.

[11] Grain including wheat, barley and oats, canola and excluding lupins

Kingwell, O'Connell and Blennerhasset (2000) used farm models to show the impact of changes in canola prices on Western Australian farm profits and rotations. They found that farm profit in the south-coast region of WA is sensitive to changes in the price of canola but the optimum area sown to canola is less sensitive. This would seem to suggest that while a farmer's decision to grow canola may be based on more variables than price alone, price and perhaps more specifically net returns per hectare, is a major determinant in deciding the area of canola to be planted. For example, the average gross return per hectare for growing canola was approximately $460[12] in 1998, compared with an average return per hectare of $230 for oats, and $355 for wheat (ABS 1998). Extending this reasoning further, expected price of canola will have an even larger impact on decision making in areas where land is not as conducive to canola production.

Even so, according to Carmody (2000), Western Australia produced its biggest canola crop on record, with the area sown increasing from 95,000 hectares in 1996 to over 900,000 hectares in the 1999/20000 season due to increased availability of mid-maturity triazine tolerant canola, an anthracnose outbreak in the lupin industry; and the skill of Western Australian canola growers and their industry advisers. However, a drop in canola price combined with a late start to the season saw, the area of canola grown in Western Australia drop dramatically in 2000/01 with the total number of hectares planted estimated to be around one third of that of the previous year.

4. World markets for Canola and Trade implications

4.1 Canola markets

Having established that the potential area that could be planted to canola has the capacity to double in Western Australia and that price appears to be one of the major determinants of the area of canola grown, it is pertinent to investigate canola markets and competition.

[12] All dollar amounts are expressed in Australian dollars unless specified.

Production as presented in Figure 1 does not provide any indication of a country's involvement in the international market place. As indicated in Figure 2, India currently participates little in the international market whilst China has become a net importer of canola oilseed. Canada is the largest individual net exporter of canola oilseed and the European Union has changed from being a net importer to becoming a net exporter at a level similar to that of Australia. Despite this, the European Union is a large exporter of oilseed having exported almost 80 per cent of that exported by Canada in 1999 (FAO 2000). However, countries within the European Union generally export to other countries within the Union resulting in net exports being substantially lower than Canada. As a consequence, Australia competes on the export market principally against Canada and the European Union.

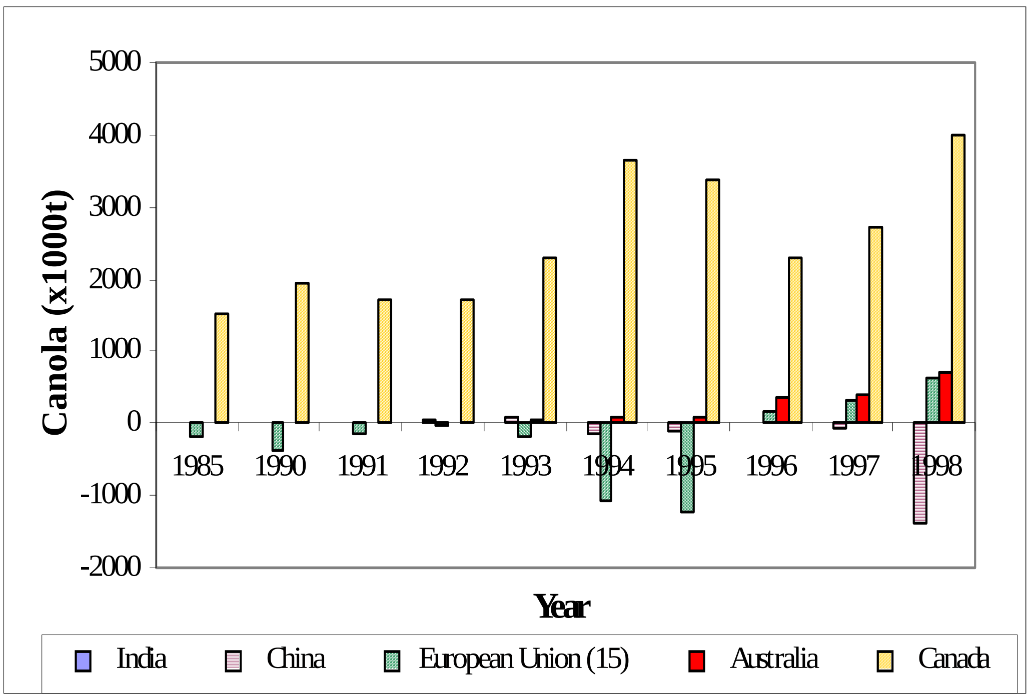

Figure 2. Net exports for canola oilseed (1985-1998) (Source: derived from FAO 2000)

In accordance with this data, Beckman (1999a) expects that in the near future, Australia will account for around 20 per cent of the world trade in canola and will then be the largest after Canada which has about 60 per cent of the world's exports of canola.

According to USDA (2000a), world oilseed exports are forecast to decline 6 per cent in 2000/01 with rapeseed expected to drop by 11 per cent and sunflower seed by 27 per cent. This forecasted decline in rapeseed and sunflower oilseed exports is due to reduced expected production combined with some countries retaining sunflower oilseed for domestic crushing (USDA 2000a). Despite this expected reduction in exports, using USDA (2000a) data, it can be shown that canola oilseed exports will still be around 8 per cent higher than in 1998/99 and almost 17 per cent higher than in 1996/97.

Oilseed crops produced in Australia include sunflower, soybean, safflower and linseed although these are relatively insignificant compared to cotton and canola with for example, the gross value of sunflower seed being only 10 per cent of that of canola in 1997/98 (ABS 1998). In 1988, canola surpassed cottonseed for the first time as the largest source of Australian oilseed (USDA 1999) and today, canola comprises the bulk of Australia's oilseed production and has shown increasing growth in production over recent years (ABS 1998a). Of the 2.4 million tonnes of canola produced in Australia in 1999/2000, Western Australia contributed 989,000 tonnes or just over 40 per cent of the total Australian crop (ABS 2000). Within Australia the domestic market has competition between the states for canola oilseed, oil and meal although this is minor. According to GPWA (2000), there is limited domestic crush capacity in Western Australia with Salisbury and Potter (1999) estimating that only 2 per cent of the annual canola crop produced in Western Australia is crushed there[13].

As a result, the Grain Pool of WA (GPWA), a statutory authority with sole export marketing rights for canola, exports most of the State's canola oilseed to overseas markets. These exports are handled directly by GPWA or under license to various grain traders such as Xcan Grain Pool Ltd. which is based in Winnipeg, Canada (Beckman 1999a).

[13] Davison Oils in Pinjarra and Kojonup Oils, Kojonup recently crushed 25 000 tonnes and 3 000 tonnes respectively (Salisbury and Potter 1999).

Australia has strengthened ties with China and Japan[14] and has also targeted South East Asia and the sub-continent for major markets because of their geographical proximity and rapid rate of income growth (Beckman 1999a). Japan imported 2,078,163 tonnes of canola oilseed in 1998 (FAO 2000) of which just under 20 per cent was exported from Western Australia. The remaining 80 per cent is made up of exports principally from other parts of Australia, Canada and the European Union. In other words, of the 1998/99 Western Australian canola crop, the GPWA exported just over 500,000 tonnes, with Japan accepting over 80 per cent of the exported oilseed and China, Bangladesh and Mexico emerging as significant markets for Western Australian canola (GPWA 2000).

If the price for vegetable oil is strong then it will support canola prices and crush demand due to canola's relatively high oil content (Oleson and Beckman 1998) whereas soybean price relies more on meal demand. As Oleson and Beckman (1998) explains, in the very short-term, supply of oilseed is fixed so price is dependant on demand, whereas on a year-to-year basis supply is determined by relative returns from other crops, crop rotation and disease decisions, weather and technological advances.

Vegetable oil prices weakened in 1999 due to large oilseed harvests in South America, record US oilseed plantings and larger plantings in the EU, China, India and Canada together with the emergence of Australia as a major world producer (USDA 1999). Consequently, as reported in May 2000, there was an excess supply of world oilseeds and in particular canola with the demand for canola being limited (Statcom 2000). It is thus understandable that Australian canola is generally priced on an export parity basis against Canadian canola into the Japanese market with changes in world prices being linked to the Winnipeg canola market and Chicago soybean market (Salisbury and Potter 1999). Although ABARE estimated that there would be a 16 per cent drop in canola prices to average $288 per tonne, Kingwell *et al.* (2000) predicted that the price of canola is likely to remain depressed during 2000 with a suggested gross price for canola being around $315 per tonne. Moreover, Statcom (2000) is predicting that unless demand for canola in countries such as China, Pakistan and India increase or there is a drought in the US, the price of canola in Canada will be lower in 2001.

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[14] The Japan-Australia Canola Association has recently been formed to facilitate the development of trade between the two countries (Beckman 1999b).

Mielke (1999) points out that farmers, worldwide have over-produced canola in 1999/2000, resulting in a large world surplus of unsold canola. Despite this predicament, oilseed prices will remain volatile although there may be a price recovery for canola seed and oil. This may arise partly because growth in palm oil production in Asia is slow, even though Asian economies are growing and demanding more oil and oilseed products and also world soybean supplies are declining, India's oilseed production is low and a further increase in Chinese imports is expected (Mielke 1999). Moreover, taking a long-term perspective, Mielke and Mielke (1999) expect world oil consumption of oils and fats to rise by 70 per cent over the next 20 years and they expect canola oilseed, oil and meal prices to remain relatively steady over the next five years with the chance that they could rise slightly.

4.2 Trade

In the various exporting countries, canola production and subsequent exports, are affected by political instability and domestic agricultural policies. In addition, international agreements directly and indirectly related to canola production influence the net exports.

As Hoffman, Dohlman and Ash (1999) explain, due to there being so many countries producing substitutable oilseed products there have been moves by those countries to encourage domestic production of oil by using domestic oilseeds an/or imported oilseeds. Although, world trade in whole oilseeds is generally characterised by low to moderate tariffs, "bound" tariffs rates[15] are in many cases still quite large among major consumers and importers of oilseeds (Hoffman *et al*. 1999). Furthermore, applied tariff rates on oilseed products, particularly oils are often greater than in whole oilseeds, a situation referred to as tariff escalation (Hoffman *et al*. 1999). Hoffman *et al*. (1999) use Japan as an example in that it produces very little oilseed and does not have any tariffs on whole oilseed, but has a tariff of about US$122 per metric ton on soyoil/rapeoil so as to protect domestic crushers.

[15] the maximum allowable under a country's WTO commitments

Non-tariff policies such as domestic price supports and differential export taxes also have the potential to distort trade in these products (Hoffman *et al*. 1999). If domestic policies that support prices or subsidise production encourage excess production and so distort trade flows, world imports could go down, exports subsidies could increase, or low-price selling on world markets could emerge (Hoffman *et al*. 1999).

To illustrate, in 1999, the Chinese government promoted domestic oilseed crushing, increased the importation of canola oilseed and delayed the issuance of import quotas for vegetable oils as well thereby reducing canola oil imports by 56 per cent (USDA 1999). Furthermore, in 1999, Pakistan increased import duties (tariffs) on soybean oil and palm oil while eliminating duties on oilseeds in an effort to raise government revenue and favor domestic oilseed producers and processors (USDA 1999). Another example lies with the US Federal Agricultural Improvement and Reform Act of 1996 which removed some of the US government programs and regulations that had previously favoured wheat and corn and so as a result increased soybean production (Oleson and Beckman 1998). Both China and the EU have domestic policies that will affect the quantity of oilseed exports with the outcome of these policies not yet clear (OECD 2000).

Exchange rates can also have a significant effect on competition for oil seeds. A devaluation in an exporter's currency relative to that of importing countries or countries competing for trade will mean exports will be cheaper and this will in turn affect world trade. Currently, canola exports from Australia are supported by generally favourable exchange rates (Beckman 1999a). This was very evident in 1998/99 when canola plantings increased by almost 50 per cent and given these larger supplies and weaker currency, Australia expanded its export market share for oilseed and oil particularly to Japan and China (USDA 1999). Furthermore, Canadian canola exports to China and Japan moderated following stiff competition from the subsequent Australian harvest (USDA 1999).

5. Plant breeding and new technology

As alluded to previously, growing canola in Western Australia is difficult with yields unpredictable. Price is a major determining factor but so is finding appropriate varieties to meet the conditions of a particular season. Consequently, specific varieties need to be developed to meet local conditions that vary between canola growing regions within the state.

As explained by Phillips (2000), most agricultural research has been undertaken by governments and publicly funded universities. However, currently in WA, as part of the national programme, there is just one joint collaborative programme between the University of Western Australia and Agriculture WA. As has occurred in Canada (Phillips, 2000), private industries such as, Pacific Seeds, AgSeed Research, Pioneer and AgrEvo all have private breeding programmes in Australia (Salisbury and Wratten 1999) with varying interests in Western Australia.

To date only varieties bred by non-transgenic means have been released commercially in Australia. While Salisbury and Wratten (1999) predicted that transgenic varieties would be available in Australia in 2001-2002, due to worldwide public backlash to GMOs (genetically modified organisms) this is unlikely. Furthermore, with the increased world GMO awareness and consumers increased demand for non-GM products (Statcom 2000), Australia has recently increased exports to countries such as those within the EU due to its status as a grower of non-genetically modified canola (Beckman 1999a). Nevertheless, breeding associated with transgenic varieties is important due to the large-scale production of these varieties in other countries and more specifically Canada, and so will be discussed.

According to Gray, Malla and Phillips (2000), there are four phases associated with creating new crop varieties with these being:

1. research;
2. gestation where the variety undergoes testing and preparation for sale;
3. adoption;
4. new varieties become part of the germ plasm and knowledge stock from which further varieties are created.

In other words, there are costs associated with research, testing, registration and promotion and benefits then accrue from farmer up-take and from the germ plasm and knowledge that accumulates. Adoption will depend not only on what the new variety has to offer but also on the seasons and growing conditions. As Gray *et al*. (2000) explain a variety offering increased yield will only be adopted if it is suitable to the length of a growing season for any one year and if other characteristics such as the level of erucic acid and glycosynilate are acceptable to the market. Furthermore, ease or production and yield characteristics associated with canola yield and oil content are also important considerations. The OECD (2000) claims that research has reduced production costs of oilseeds and oilseed products worldwide. Even so, Shands (1999) claims that it may take 15-20 years to plan, initiate and conduct a new breeding program before any results are produced.

However, with new technologies such as double haploid, molecular marker and hybrid, it is likely that results of a breeding programme could be seen in as little as five years. A model[16] developed for Canola Breeding WA (CBWA) of which UWA is a member, indicates that this technology is vital for a breeding programme to be viable and competitive. Nevertheless, as Phillips (2000) explains in detail, with so much of the breeding methods, biotechnologies, germplasm and seed stock being privately controlled, public organisations such as UWA must be prepared to collaborate will private industry so as to enable them to complete in the canola breeding domain. If they choose not to take such a path then, in accord with Phillips (2000) preliminary results found from the model as described above, indicate that the benefits are barely greater than the costs and so the public sector has little reason to undertake canola varietal development.

Besides improving varieties, plant breeding also has a role in producing canola products for niche markets. Davies (1996), explains in detail the enormous potential of new rapeseed cultivars with oils having well-defined uses in the food, detergent, and lubricants industries. In addition, he believes that specialty oils may also be developed with pharmaceutical and chemical feedstock applications in mind and that the genetic engineering of oilseed plants promises to be one of the most impactive and impressive sources of new crops for both new and existing applications.

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[16] Developed principally by Jo Pluske and Wallace Cowling

Despite these high hopes, the introduction of commercial GM canola, even for simple production advantages has not yet reached Australia. Although, transgenic cotton is produced in the Eastern States policy discussions with regard to canola are still in process, and it is not know if and when transgenic canola will be commercially grown in Australia. Nevertheless development is occurring and in 1997, Canada exported small amounts of transgenic canola seed to the US, Australia, Belgium, Finland and South Africa mainly for testing (Isaac and Phillips 1999). As much of the transgenic canola have been developed specifically for Canadian conditions they usually need to be crossed with local seeds in different countries for them to be economically viable (Isaac and Phillips 1999). In order for such trials to be as safe as possible, the Western Australian canola industry has adopted a Code of Practice to govern the conduct of genetically modified (GM) crop trials (Ag WA 2000).

Even so, according to Biotechnology Australia (1999), it will be some years before there is a consistent approach to the GM issue across a range of countries and so markets will develop for genetically modified and genetically modified-free products. As Jones and Bankowska (2000) explain, agricultural biotechnology has changed market dynamics considerably although the 1999 grain market in aggregate was able to find buyers for a non-segregated oilseed crop. Nevertheless, in the medium term, the same author predicts that there is likely to be specialty markets for gene technology-free products and this raises issues of how to ensure segregation for specific markets and whether to develop certification procedures to guarantee the characteristics of products for specific markets.

Countries are already thinking along these lines with Japan having proposed a law requiring that foods that can be verified to have genetically engineered content (vegetable oils are exempt) be labelled as from April 2001 (Hoffman *et al*. 1999). Furthermore, the EU has proposed labeling requirements for all food and animal feed products containing genetically engineered organisms (Hoffman *et al*. 1999). Therefore, as Hoffman *et al*. (1999) have stated there may need to be science-based risk assessment and a uniform set of rules and standards for all countries so as to facilitate world trade of genetically engineered organisms.

This notion is backed by Harland (2000) who acknowledges that demand for GMO-free feed is increasing in Europe and the United Kingdom, however, there is a lack of definition of what is GMO-free and countries have varying interpretations of what feed contains viable organisms and what does not. In addition, Harland (2000) believes that the production of genuinely GMO-free feeds would incur extra costs and who will pay this extra cost is unanswered as only one supermarket in the UK currently offers a premium of 15 per cent on produce raised on GMO-free diets (Harland 2000). The issue of segregation and willingness to pay for non-GM products is complex and is set to become a fundamental issue in canola production in Western Australia but will not be elaborated upon further in this paper[17].

6. Conclusion

This paper attempts to provide some insight into factors associated with canola production in Western Australia. While Australia is still a small canola producer, it is the fifth largest producer in the world and it can be shown that the physical resources are available to increase production. Nevertheless, there are several limitations that will restrict output in the short and perhaps medium term. Perhaps the greatest physical issue is that farmers need reliable varieties so as to minimise risks associated with production. More reliable enterprise alternatives, such as wheat and sheep, will be produced in preference to canola if farmers do not have confidence in growing canola.

Production is also dependent on canola oilseed price that is complicated by prices of oil and meal and substitute markets. Canola oil is not a staple food source and consequently the standard of living within countries has a large effect on demand and ultimately price. Trade policies associated with imports of oilseed, oil and meal also reflect the end product that leaves Australia and the price received for those products. Even so, Western Australia has reliable markets for its canola oilseed, especially while there is doubt surrounding GM canola from Canada, and the medium term outlook for canola products is encouraging.

[17] Burton, James, Lindner and Pluske explore this topic further in their paper, “A Way Forward for Frankenstein Foods” presented for the 4th International Conference of the International Consortium on Agricultural Biotechnology Research (ICABR) on " The Economics of Agricultural Biotechnology " Ravello, (Italy) August 24 - 28, 2000.

Also, in their paper "Welfare Effects of Identity Preservation and Labelling of Genetically Modified Food" to be presented at the AARES 45th annual conference.

Canola production in Western Australia is largely based on market prices. If the prices are high enough to cover the risks associated with producing the crop then it will be grown extensively as in the 1999/2000 season. However, a drop in price combined with unfavorable seasonal conditions will see significant decreases in production as has been the case in 2000/01. Therefore canola varieties produced for local conditions and also for market expectations will decrease risk and so help smooth the fluctuations currently experienced in canola production.

Producing these varieties though is not as straightforward as was once the case for plant breeding. The production of canola varieties is complicated by patents and agreements and resources that were once freely exchanged by colleagues are not so readily available. Therefore, for a public organisation such as UWA to be involved in a successful plant breeding programme, it must collaborate with private groups so that it can obtain such information.

The market outlook for canola is bright and the potential for Western Australia to successfully grow canola is encouraging. Nevertheless, reliable varieties must be developed for the industry to be prosperous in the longer term.

7. References

ABS, 2000, '7111.0 Record wheat and canola crops: ABS media release - 31st October 2000 (150/2000)', Retrieved from http://www.abs.gov.au on 2nd November 2000.

ABS, 1999, '7121.0 Agricultural Commodities, Australia, 1998-99' Retrieved from http://www.abs.gov.au on 15th September 2000.

ABS, 1998, '7113.0 Agriculture, Australia, 1997-98', Retrieved from http://www.abs.gov.au on 2nd November 2000.

Ag WA, 2000, 'News release - GM Canola Technical Working Group Ratifies Code of Practice for GM Crop Trials', Agriculture Western Australia, Retrieved 9 January, 2000 from the World Wide Web http://www.agric.wa.gov.au/Whats_new/news/News2000/l_Dec00P/001201canola.htm

Beckman, C. 2000, 'China: Oilseeds, Situation and Outlook', *Agriculture and Agri-food Canada, Bi-weekly Bulletin*, vol. 13, no. 13, Retrieved 5 October, 2000 from the World Wide Web http://www.agr.ca/policy/winn/biweekly/index.htm.org

Beckman, C. 1999a, 'Australia: Situation and Outlook for Canola', *Agriculture and Agri-food Canada*, *Bi-weekly Bulletin*, vol. 12, no.18, Retrieved 5 October, 2000 from the World Wide Web http://www.agr.ca/policy/winn/biweekly/index.htm.org

Beckman, C. 1999b, 'Protein Meal: Situation and Outlook', *Agriculture and Agri-food Canada, Bi-weekly Bulletin*, vol. 12, no. 11, Retrieved 5 October, 2000 from the World Wide Web http://www.agr.ca/policy/winn/biweekly/index.htm.org

Biotechnology Australia, 1999, 'Developing Australia's Biotechnology Future', Discussion Paper, September 1999. A Federal Government Initiative. Commonwealth of Australia.

Crop Updates Oilseeds 2000

Carmody, P. (2000), 'Record canola crop for Western Australia - 1999', Introduction - Oilseed Updates 2000, Agriculture WA, Retrieved 14 July 2000 from the World Wide Web http://www.agric.wa.gov.au

CCC, 2000a, 'Oilseed Industry Overview', Canola Council of Canada *Last updated: February 10, 2000.* Retrieved 14 July, 2000 from the World Wide Web: http://www.canola-council.org

CCC, 2000b, 'Council publications – dietary fats chart', Retrieved 14 July, 2000 from the World Wide Web: http://www.canola-council.org

Colton, B. and Potter, T. 1999, 'History', in Salisbury P.A., Potter T.D., McDonald G., Green A.G. (eds.), *Canola in Australia – the first thirty years*, produced for the 10th International Rapeseed Congress, Canberra, Australia.

Davies, H.M. 1996, 'Engineering new oilseed crops from rapeseed', In: J. Janick (ed.), Progress in new crops, ASHS Press, Alexandria, VA. pp. 299-306.

FAO, 2000, 'FAOSTAT - Agriculture data', Retrieved October 19, 2000 from the World Wide Web: http://apps.fao.org/cgi-bin/nph-db?subset=agriculture.

GPWA, 2000, 'Canola', *The Grain Pool of Western Australia*, Retrieved from http://www.gpwa.com.au on 15th September 2000.

Gray, R., Malla, S. and Phillips, P. 2000, 'Gains to yield increasing research in the evolving Canadian canola research industry', in William Lesser. Storrs, CT (ed.) *Transitions in Agbiotec: Economics of Strategy and Policy*, Food Marketing Policy Centre, University of Connecticut, Retrieved from the World Wide Web: http://agecon.lib.umn.edu/ne165.html

Harland, J. 2000, 'What is GMO-free?', *Feed International*, vol 21, no. 7, pp. 6-8.

Hoffman, L. Dohlman, E. and Ash, M. 1999, 'Upcoming world trade organisation negotiations: Issues for the U.S. oilseed sector', Pecial Article, Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture, October, 1999, Retrieved 25 September, 2000 from the World Wide Web: http://www.econ.ag.gov.

In, F. and Inder, B 1997, 'Long-run relationships between world vegetable oil prices', *Australian Journal of Agricultural and Resource Economics*, vol. 41, no. 4, pp. 455-470.

Isaac, G.E. and Phillips, W.B. 1999, 'The BioSafety Protocol and International Trade in Transgenic Canola: An economic assessment of the impact on Canada', In Proceedings of the NE-165 Conference, Washington DC, 24-25 June, pp386-406.

Johnson, D., Satyanarayana, V., Dahl, B. and Dooley, F. 1996, 'Trade in minor oilseeds: a spatial equilibrium analysis of sunflower and canola', *Agricultural economics report,* No. 353, Department of Agricultural Economics, North Dakota State University, Fargo, ND 58105.

Jones, E. and Bankowska, A. 2000, 'The impact of biotechnology on the grains and oilseeds food system', paper presented at the 4th International Conference on The Economics of Agricultural Biotechnology, Ravello, Italy. August 24-28, 2000.

Kingwell, R., O'Connell, M. and Blennerhasset, S. 2000, '2000 Crop Updates Oilseeds', Outlook for prices and implications for rotations, Retrieved 14 July, 2000 from the World Wide Web: http://www.agric.wa.gov.au/cropupdates/2000/oilseeds/Kingwell.html-ssi

Lordkipanidze, N., Epperson, J.E. and Ames, G.C.W. 1996, 'An economic analysis of import demand for canola oil in the United States', Paper from the Faculty Series, Department of Agricultural and Applied Economics, University of Georgia, US.

Mielke, T. 1999, 'The world supply, demand and price outlook for oilseeds, vegetable oils and oilmeals', keynote address, 10th International Rapeseed Congress, Canberra, Australia, 26-29 September.

Mielke, S. and Mielke, T. 1999, 'Oil World 2020', ISTA Mielke GmbH Langenberg 25, 21077, Hamberg Germany.

Norton, R., Kirkegaard, J., Angus J. and Potter, T.D. 1999, 'Canola in rotations', in Salisbury, P.A. Potter, T.D. McDonald, G. Green A.G. (eds.), *Canola in Australia – the first thirty years,* produced for the 10th International Rapeseed Congress, Canberra, Australia.

OECD 2000, 'The Outlook in Brief', Retrieved 20 December, 2000 from the World Wide Web http://www.oecd.org/agr.

Oleson, F. and Beckman, C. 1998, 'Protein Meal: Situation and Outlook', *Agriculture and Agri-food Canada, Bi-weekly Bulletin*, vol. 11, no. 8, Retrieved 5 October, 2000 from the World Wide Web http://www.agr.ca/policy/winn/biweekly/index.htm.org

Phillips, P. 2000, 'Intellectual property rights and public research in Canada', in V. Santaniello *et al*. (eds.), Agriculture and Intellectual Property Rights: Economic Institutional and Implementation Issues in Biotechnology, CAB International.

Pothidee, A. Open, S.T. Allen, A.J. and Hudson, D. 1999, 'Impacts of corn and soybean meal price changes on the demand and supply of US broilers', paper prepared for the Meetings of the American Agricultural Economics Association, August, Nashville, Tennessee.

Potter, T., Marcroft, S., Walton G. and Parker, P. 1999, 'Climate and soils', in Salisbury, P.A. Potter, T.D. McDonald, G. Green A.G. (eds.), *Canola in Australia – the first thirty years*, produced for the 10th International Rapeseed Congress, Canberra, Australia.

Salisbury, P.A. and Potter, T. 1999, 'Marketing', in Salisbury, P.A. Potter, T.D. McDonald, G. Green A.G. (eds.), *Canola in Australia – the first thirty years*, produced for the 10th International Rapeseed Congress, Canberra, Australia.

Salisbury, P. and Wratten, N. 1999, 'Brassica Napus Breeding', in Salisbury, P.A. Potter, T.D. McDonald, G. Green A.G. (eds.), *Canola in Australia – the first thirty years*, produced for the 10th International Rapeseed Congress, Canberra, Australia.

Shands, H.L. 1999, 'Plant Breeding: a reappraisal', in Janick J. and Simon J.E. (eds.), *Advances in new crops*, Timber Press, Portland, OR. pp 96-98.

Statcom, 2000, 'World canola situation and outlook', Retrieved 14 July, 2000 from the World Wide Web, www.statcom-online/canolahome/index.html.

USDA 2000a, 'Oilseeds: World markets and trade – World oilseed exports forecast to decline in 2000/01', Retrieved 14 July, 2000 from the World Wide Web: http://www.fas.usda.gov/oilseeds/circular/2000/00-07/julcov.html

USDA 2000b, 'Into the Marketplace - Cooperative Research and Development Agreements', Agricultural Research Service - News and Information, USDA, Retrieved 5 October 2000 from the World Wide Web: http://www.ars.usda.gov/is/qtr/q196/m196.htm

USDA 1999, 'Oil Crops Yearbook', Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture, October, 1999, Retrieved 25 September, 2000 from the World Wide Web: http://www.econ.ag.gov

Walton, G., Mendham, N., Robertson, M. and Potter, T. 1999, 'Phenology, physiology and agronomy', in Salisbury, P.A. Potter, T.D. McDonald, G. Green A.G. (eds.), *Canola in Australia – the first thirty years*, produced for the 10th International Rapeseed Congress, Canberra, Australia.