Australian Oilseed Federation

Review of the High Oleic Oil Industry

A project of the AOF Oilseed Development Fund

February 1997

Prepared for the AOF by Meyers Strategy Group Pty Ltd

Introduction

Internationally, and on the Australian domestic market, palm oil commands a dominant position in the edible oil market. Hard oil type products are widely used by the food service sector and offer good cooking performance (particularly as frying oils) at a competitive cost.

Developments in varietal breeding and oil extraction processes have resulted in soft oils with similar cooking properties to the traditional hard oil products, but without the negative nutritional aspects. The market opportunities for these soft oil products will be largely determined by the perceived health benefits of changing from hard oils in relation to the additional cost of the soft oil products.

Within it's strategic plan, the Australian oilseed industry proposed a target replacement of hard oils of 1 per cent per annum on the domestic market. However, this was based on varieties available at that time. With the new varieties available, the industry believes there is an opportunity to exceed this target.

The focus is on those oils with high oleic properties, with high oleic sunflower, the predominant oil currently available. The marketing sector has been able to achieve significant success in convincing food service operators to shift to these oils and currently face the situation of being unable to meet demand given the low production of these oilseeds in Australia. Thus, it is a high industry priority to develop the production of high oleic oil. Cottonseed oil has also played a role in switching more cost conscious users from hard oils.

As a result, the Australian Oilseed Federation (AOF) has commissioned this project to expand the production of high oleic oilseeds to take advantage of the opportunity to switch users from imported hard oils to domestically produced soft oils. This project aims to identify the impediments to expansion (production factors, varieties, pricing, logistics and infrastructure), develop recommendations to AOF for action to address these and develop a promotional package to encourage increased production.

Methodology

Research was conducted with each sector of the supply chain. The methodology used and the objectives of each stage are illustrated in Figure 1.

Figure 1: Methodology

Research	Growers Liverpool Plains, Darling Downs and Central Queensland	Survey and interviews with five growers from each region to identify key production factors and comparative economic analysis
	Crushers	Personal and telephone interviews to identify market opportunities and key issues
	Refiners and end users (retail, food service and industries)	Personal and telephone interviews to identify market opportunities, costs and benefits of high oleic oil and constraints to development
	Plant breeders and researchers	Telephone interviews to identify breeding objectives and progress, key issues and future trends and expectations
Analysis	Analysis	To reveal key issues and recommendations
AOF consultation	AOF consultation	Report finalisation including strategic recommendations and promotional package

Scope and Structure of the Report

This project provides a qualitative profile of the high oleic industry through in depth interviews and surveys with industry participants. This has been supported by a qualitative economic analysis at the grower level to ascertain relative competitiveness of high oleic sunflower production.

The project objectives are to:

- establish opportunities for high oleic oils;
- establish the competitive position of high oleic oil, particularly for growers and end users;
- develop recommendations for development of the high oleic oilseed industry; and
- develop a promotional package targeted at growers to encourage production of high oleic oilseeds.

The report structure provides a brief summary of the methodology used, followed by a brief background on the oils and fats market in Australia, including the role of high oleic oils.

Key findings from the research have been presented in tabular form, from which a discussion of key issues has been developed. These key issues have been utilised in presenting recommendations to the AOF.

Following consultation with the AOF, this draft report, will be finalised to include strategic recommendations for development of the high oleic oil industry and a promotional package targeted at growers to encourage production.

Acknowledgements

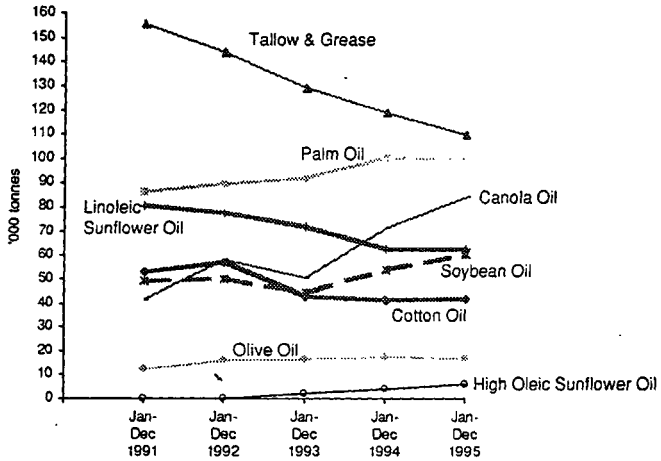
Meyers Strategy Group would like to thank those members of the AOF and others who provided considerable information in preparation of this report and contributed freely of their time.

Oils and Fats Market in Australia

The oils and fats market in Australia comprises yellow spreads, cooking oil, salad dressings and non edible oils. The products comprising the oils and fats industry are categorised into two broad groups. These are hard oils, such as palm and tallow, which are solidified at room temperature and soft oils, such as sunflower, canola and cottonseed oil, which are liquid at room temperature.

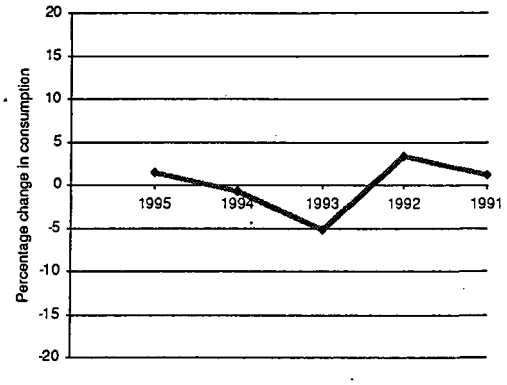
Current Australian consumption of edible oils and fats is approximately 415,000 tonnes per annum. Of this, consumption in the food service sector accounts for around 284,000 tonnes and the retail sector 131,000 tonnes (see Appendix 6). Current consumption frying oils is illustrated in Figures 2 and 3.

Figure 2: Domestic Consumption



Source: Oil World Annual, 1996

Figure 3: Change in Total Domestic Consumption, 1991–1995



Source: Oil World Annual, 1996

Total domestic consumption has been relatively stable over the last five years. A significant five per cent decrease in 1993 was supply driven, rather than demand, due to widespread drought conditions in northern production areas of NSW and Queensland. This significantly impacted on cotton and sunflower (linoleic) oil supplies, as indicated in Figure 2 and 3.

Fats and oils are consumed for a number of edible and non-edible purposes in Australia. These uses are shown in Table 1.

Table 1: Uses of Fats and Oils

Edible	
Home use	• spreads • bottled oils
Food service Industry	• spreads • frying • salad dressings • cake and pastry margarine
Food manufacturing	• pastry margarine and shortening • liquid frying oils • frying oil • salad dressing oil • Pharmaceutical formula ingredient • spray oils • dairy spreads • coffee whilcners
Non-edible	
Manufacturing	• cosmetics • lubricants • detergents • paints • crop spray adjuvants

The consumption and attitudes of consumers to oils and fats have changed considerably over the last twenty five years, as consumers have become more aware and concerned about their health. This has been evident by the swing away from butter to margarine, as consumers have sought to reduce their consumption of saturated fats. Lately, there has been increased consumption of mono-unsaturated fats at the expense of poly-unsaturated fats. However, there remains considerable confusion amongst consumers in relation to the roles, properties and relationships between different fat types and the costs and benefits of cholesterol in the diet.

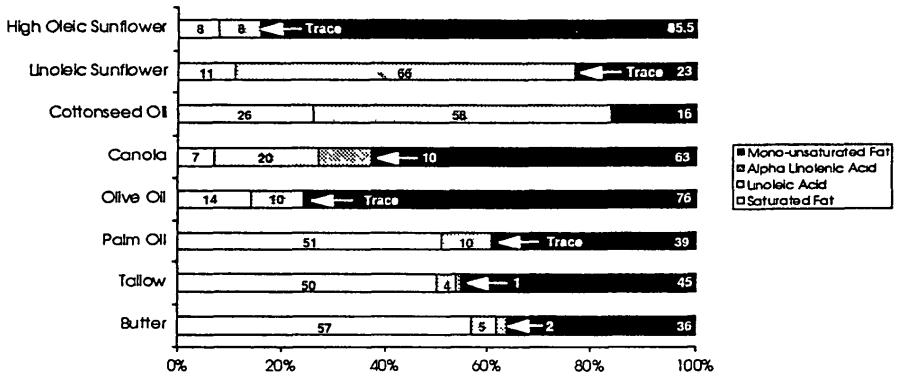
High Oleic Oils

High oleic oils have a real opportunity to substitute existing products used in high stability applications due to functional, health and sensory benefits offered. This is pertinent to the substitution of oils with high saturated fatty acid levels such as palm, tallow, dairy and hydrogenated vegetable oils.

Interest in the good health properties of mono-unsaturated fats has stemmed from the observation that people in Mediterranean countries had high fat diets, made up primarily of high oleic fatty acid, but a low incidence of coronary heart disease (CHD). The reason for this phenomenon was proven through research by Mensink and Katan in 1987 which showed that diets high in oleic acid can reduce low density lipoprotein cholesterol (LDL) and have no effect, or may increase, high density lipoprotein cholesterol (HDL). HDL is protective against CHD and LDL is associated with higher incidence of CHD.

A comparison of the fatty acid profiles of current oils used in Australia is illustrated in Figure 4.

Figure 4: Comparison of Dietary Fats



Source: Meadow Lea Foods

Interest to substitute current oils used by food service organisations and processors of cereals, snack food products and food spray oils has been evident and awaiting the development of viable opportunities at a competitive price.

High oleic oils present a viable alternative for use in market segments requiring high stability applications. These include:

- deep frying in food service and snack food manufacturing;
- food products such as mayonnaise, dairy spreads, pastry goods, margarine's;
- food spray oils; and
- lubricants.

Mono-unsaturates have higher rates of oxidative stability and, consequently, have lower formation rates of oxidation products. Oleic acid is 10 times more resistant than linoleic add and 25 times more resistant than linolenic acid to oxidative breakdown. Table 2 shows the inherent stability of common oils and fats.

Table 2: Inherent Stability of Fats and Oils Calculated from Relative Rates of Oxygen Reactivity

Oil	Iodine Value	Inherent Stability*
Safflower	149	7.6
Soybean	132	7.0
Sunflower	136	6.8
Corn	128	6.2
Low linolenic soybean	115	6.0
Canola	120	5.5
Cottonseed	110	5.4
Peanut	100	3.7
High Oleic sunflower	85	1.9
Lard	62	1.7
Palm	50	1.3
Palm kernel	13	0.3
Coconut	8	0.2

' Based on relative rate of oxygen reactivity oleic 1; linoleic 10; and linolenic 25 Modified from Erikson, Food. Tech. 48.64 (1994)

Source: Warner,1996

High oleic oils, are reasonably stable when used in cooking or when in storage. They have moderate melting points and chemically are quite reactive and flexible. This enables controlled processing at various temperatures and pressures which can be used to produce products with selected melting points and with properties designed for specific food use. They also offer good sensory characteristics such as a neutral or nutty flavour combined with a smooth feel.

In comparison, poly-unsaturates are relatively unstable and have a tendency to oxidise at normal temperatures. They too are chemically are quite reactive, but at times, can be too reactive. Poly-unsaturates provide dietary benefits of linoleic acid and a-linoleic acid, an important source of omega-3 fatty acid.

Palm oil offers good cooking life due to the development free fatty acids and polar fractions, also due to the tendency to solidify. However, the cause of these functional benefits, namely high levels of saturated fatty acids, also cause palm oil to be unhealthy. It is for this reason, as well as being imported, that palm oil is targeted for substitution.

High oleic products offer a good opportunity to replace hydrogenated soft oils due the associated problems with this process. Hydrogenation causes increased levels of unhealthy trans fatty adds in the resulting product. Added to this it, is costly at about $150 to $200 per metric tonne of oil and results in a less natural product to be marketed.

High oleic oil offers the functional benefits of oxidative stability and nutritional attributes, in terms of positive impacts on the risk ofCHD. Olive oil is high in mono-unsaturated fats, but is too expensive to be cost effective for the food service sector. Canola is good nutritionally, however, it contains high levels of linolenic acid (also known as Omega 3) which is healthy, but unstable and can provide unfavourable odours.

It is against this background of domestic consumption and uses of oils and fats, combined with the health and functional competitive advantages of high oleic oils, that the research described in the following section has been undertaken.

Research Findings

The information gathered from the surveys and interviews undertaken has been compiled in this section, representative of each sector in the supply chain. The main points of the findings have been tabulated, from which the drivers and restrainers to industry growth have been distilled.

3.1 Growers

Role/Status of High Oleic Sunflowers

- 1996/97, 40,000 hectares forecast planting producing 16,000 tonnes of oil
  - Liverpool Plains - 22,000 ha
  - Darling Downs - 9,000 ha
  - Central Queensland - 9,000 ha
- Adequate price premium to linoleic sunflowers to compensate for yield reductions (see Appendix 1)
  - Early season crop = $85 per tonne premium
  - Late season crop = $50 per tonne premium
- Lower gross margins for Central Queensland due to less premium and added freight cost (see Appendix 1)
- Price premium to linoleic will not necessarily influence crop choice against other species
- High Oleic yield reduction compared to Linoleic
  - Liverpool plains and Darling Downs = 20 per cent
  - Central Queensland = 10 per cent
- Grower crop choices (see Appendix 2) are based on:
  - net returns i.e. price x yield
  - agronomic reasons e.g. rotation
- Acreage contracts available for high oleic sunflowers only
- High oleic seed segregated from high linoleic seed
- Lack of information available
  - marketing
  - variety trials
  - end uses
  - research
  - uniform terminology
- Concerns about marketers/crushers manipulating the market
- Opportunistic growers entering the industry with little experience can gain poor perception of industry
- Seed availability constrained growth in early years
- Fear of market erosion by Central Queensland growers from high oleic brassicas

Drivers of Growth

- High relative net returns
- Low risk contracts
- Information
- Crop support

Restrainers of Growth

- Relative low yield if inadequate price compensation
- Lack of information
- Agronomic costs greater than benefits for sunflowers

3.2 Crushers

Role/Status of High Oleic Sunflowers

- Domestic market for high oleic oil estimated at 6-9,000 tonnes in 1996 which is a 50 per cent increase to 1995
- Premium is paid by refiners on advice from crushers and is passed on in full to growers
- Sunflowers historically have logistical impediments
- Oil content same as linoleic i.e. approximately 40 per cent
- Meal is comparable to linoleic
- Large multi purpose crushing facilities crush the majority of production
- Hectare contracts mean crushers share production risk with growers
- Short runs add to costs of production
- High oleic market is seen to lack depth and liquidity
- Late season crop is unreliable and cannot be planned for by crushers or refiners
- Exports are relatively uncertain
- Lack of information on world production
- 1997 exports are to
  - — US
  - — Japan

Drivers of Growth

- Pull through demand
- Export opportunities

Restrainers of Growth

- Market liquidity and depth
- Crushing economies
- Supply volumes
- Supply logistics
- Production volatility (late season crop)

3.3 Refiners/Marketers

Role/Status of High Oleic Sunflowers

- Contract requirements with crushers
- Pay premium over linoleic to encourage production
- High oleic oil offers benefits of:
  - monounsaturated health attributes
  - oxidative stability functional properties
- Oil is bleached, refined and deodorised
- Supply constraints have caused restrictions to:
  - retail supply and shelf listings
  - food service supply
  - industrial supply
  - promotion of high oleic products
- Have imported high oleic oil to maintain supply integrity
- Varying views on high oleic relative frying life to competitor products
- Greatest opportunities for industry growth seen to be in food service and industrial markets (see Appendices 3 and 4)
- Industry has grown by up to 50 per cent per annum in early years
- Need for a common name
- Standards needed to support oil content claims
- Dichotomy of views for best positioning of high oleic
- Fear of creating further consumer confusion with adverse impact on consumption
- Current promotion is aligned to species

Drivers of Growth

- Health benefits
- Functional properties
- Yield improvement
- Growing expenditure on eating out

Restrainers of Growth

- Supply
- Price in retail and food service markets
- Consumer confusion
- Labelling
- Restrained promotion to match limited supply
- Cost of supply integrity
- Product positioning undefined

3.4 End Uses - Retail

Role/Status of High Oleic Sunflowers

- Products
  - spreads — market value $420 million
  - dressings — market value $76 million
  - bottled oils — market value $144 million
- High oleic offers:
  - functional properties i.e. longer shelf life compared to all products with higher content of linolenic and linoleic acid
  - health benefits
- High oleic a dual purpose product for frying and dressings
- Mature market for health segmentation
- Price points set at price competitive levels
- High oleic supply restrictions
- High oleic raw material price only competitive with olive oil
- Lacks common name for promotion
- Promotion and brands are species aligned

Drivers of Growth

- Health benefits
- Shelf life
- Dual purpose properties
- Demand for health products

Restrainers of Growth

- Price
- Supply
- Consumer confusion
- Declining/static market
- Declining consumption of spreads
- Market mature, highly segmented with full range of products

3.5 End Use - Food Service

Role/Status/Opportunity of High Oleic Sunflowers

- Products
  - frying oil
    - deep – market value $88.4 million (1994)
    - shallow – market value $6.6 million (1994)
  - dressings – market value $17.7 million (1994)
  - margarine – market value $ 9.7 million (1994)
- Target Segments
  - QSR
  - independents
  - restuarants
  - caterers
  - institutional/health
- QSR's price conscious with uniform supply requirements
- Independents do not percieve health benefits as marketable
- QSR's may be sensitive to industry pressure on health issues
- Restaurants health conscious and a high value market
- Current product offerings relatively unhealthy
- Cottonseed has half the saturated fat of palm or tallow and is price competitive
- High oleic pourable
  - advantage from ease of use and OH&S
  - disadvantage from container in terms of cost, post use storage and disposal
- Uncertainty as to relative frying life economies of high oleic compared to competing products
- Only one brand name in segment which signals a common name

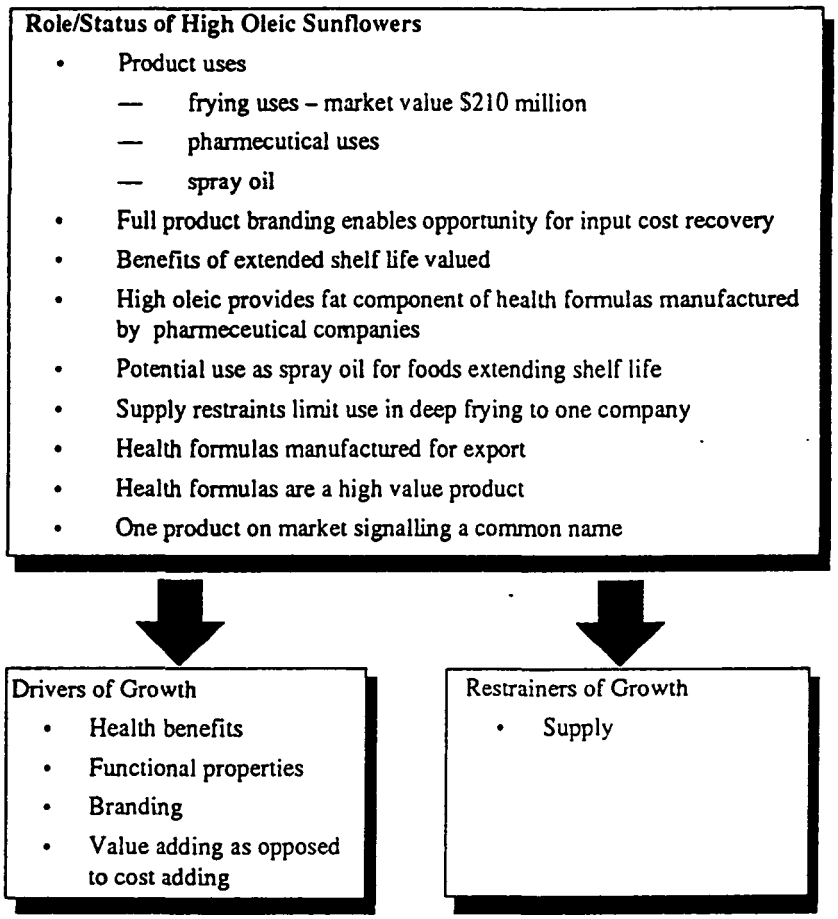
Drivers of Growth

- Health attributes
- Functional properties
- Common recognisable name
- Changing eating patterns
- One product for all oil uses

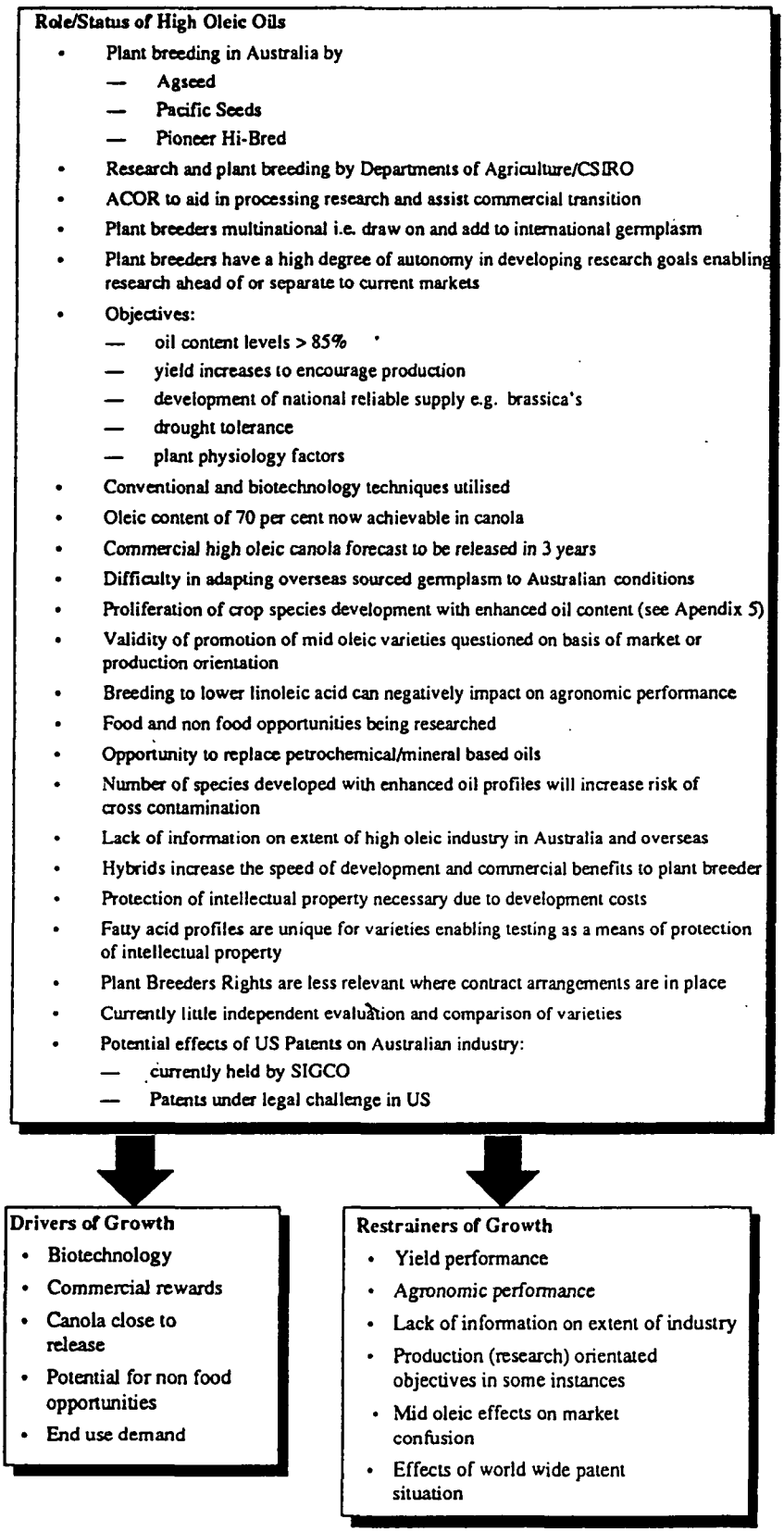
Restrainers of Growth

- Supply
- Price
- Cottonseed oil competition
- Limited perceptions of health segment benefits/ opportunity

3.6 End Use - Industrial



3.7 Research and Development



Key Issues and Recommendations

The research findings from Section 3.0 have been used to identify the key issues affecting the development of the high oleic oil industry. This section discusses the those issues in terms of their meaning and importance to the industry. Recommended actions to address the issues discussed are included throughout the section.

Whilst this project was initiated with a key objective of increasing high oleic oilseed production, it has clearly emerged throughout the project that increases in production need to be planned and coordinated with market development. Thus, whilst production is forecast to increase significantly in the current season, much of this increase is in Central Queensland which the marketers were unable to plan for and thus, had not included this in sales and promotion.

There is potential for the traditional boom/bust scenario, that is typical of new industries, to develop in relation to high oleic sunflower. This boom/bust cycle is driven by producers responding to premium markets faster than markets are developed and then reducing production in response to poorer returns, just as markets are crystallised. In this instance, it is likely to be exacerbated due to the opportunistic production area of Central Queensland.

Thus, this emphasises the need to ensure that the development of new markets and production of high oleic sun and other new oil types are coordinated to ensure that grower and customer confidence is maintained.

The second key objective of this study was to identify lessons for development of other new oil types. Again, the above issue is of paramount importance. In some cases, where markets are specialised and only likely to involve niche opportunities, the stability in development is being achieved by commercial arrangements developed between the plant breeders, seed production companies, crushers and marketers (domestic and overseas). Whilst there are some grower concerns emerging above such arrangements, much of this can be largely overcome through better communication about the nature and purpose of such arrangements and, infact, for some growers there may be opportunity to participate through investment in these arrangements.

Thus, the following issues are discussed in relation to the above objectives. The direct outputs of the study remain strategies to increase production, but there are a number of other recommendations made to AOF and other issues highlighted for information.

Market Related

Oil Type or Species Differentiation

Historical crop development and research has been undertaken, reported and implemented on a crop species basis. This has led to a close association in consumer products to the raw materials used in their creation. This has been to such a degree, that not only marketing programs, but also company strategies are built around this relationship.

An issue emerging for high oleic sunflowers and other specialty oils being developed, is whether they will be differentiated by their crop species origin or by the core oil content.

There are three possible options, differentiation by species, by oil content or a combination of the two. Differentiation by oil content enables the development and marketing of species blends of uniform oil content.

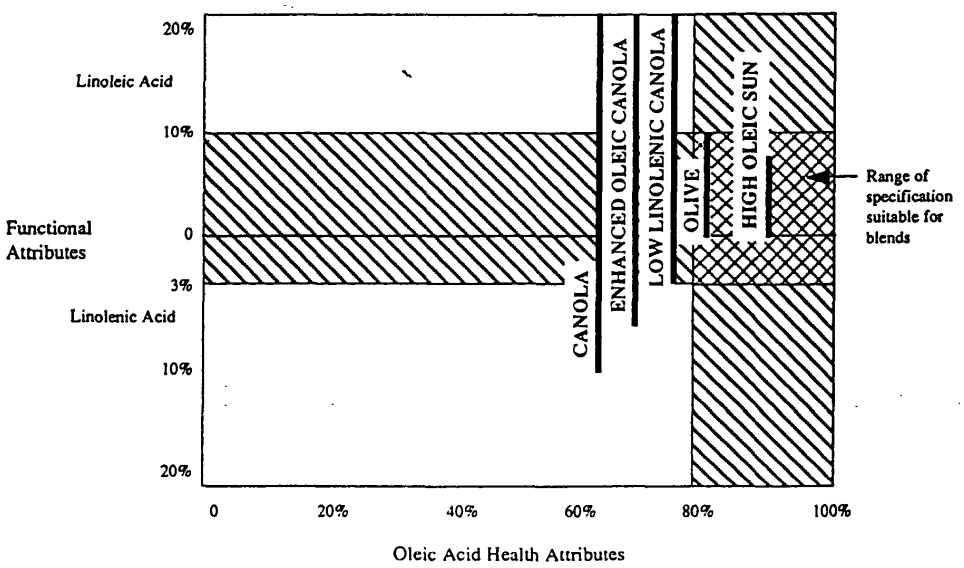
The need to address this issue is only around the corner, with commercial production of high oleic canola predicted in three years. The approach taken by the high oleic industry and it? participants is likely to effect:

- the degree of cannibalisation of species based markets;
- sourcing opportunities, by amount, value and season;
- development of a harmonised name/names for high oleic based products;
- promotion and education programs; and
- pricing systems used for the raw material.

If product differentiation remains species based, high oleic sunflower and canola products will be in direct competition. This will possibly result in cannibalisation of the current high oleic market, as opposed to increasing overall market share.

However, oil content differentiation is based on the assumption that different species can be bred to within the same range of specifications. To date, this has been difficult to achieve with two strains of enhanced canola incorporating different oil contents, which in turn vary to high oleic sunflowers. Enhanced oleic canola has 8-9 per cent linolenic acid and 70 per cent oleic and low linolenic canola has 3 per cent linolenic acid and 75 per cent oleic. High oleic sunflower contains only trace quantities of linolenic acid and greater than 80 per cent oleic. The relative health and functional attributes of species and varieties is illustrated in Figure 5, which relates to the ideal range of specifications.

Figure 5: Relative Health and Functional Attributes



Discussion

The outcome of species versus oil type differentiation are most likely to be determined by the commercial decisions of refining companies. The actions of the AOF, in terms of naming and labelling regulations, will be effected by this issue or, alternatively the development of this issue can be driven by the actions of the AOF. The AOF must take a proactive position as to the future of differentiation of high oleic oils and that position must be aimed at maximising flexibility for the industry, in terms of the points listed above.

Specific recommendations are incorporated into the subsection, Naming/Standards.

Market Development

The opportunities for high oleic oil have been driven domestically through import replacement of hard oils, primarily palm oil. Palm oil imports are currently 99,200 tonnes, valued at $110 million, per annum. Palm oil is by far the largest single oil product imported and the only direct imported competitor, of any consequence. Given current production of high oleic sunflowers of approximately 16,000 tonnes, there remains substantial opportunity for direct import replacement. However, there a re a number of variables that impact on this opportunity, particularly price. High oleic oil will continue to trade at a premium to palm oil for functional and health properties.

In the short run, it is likely that opportunities to expand the industry may be in export markets, which are less price sensitive. Seed and oil exports are predicted in 1997 to the US and Japan, although this appears to be a short term opportunity driven by world shortages. In some cases, substitution is driving these opportunities and, in others, an inherent demand for high oleic sun oil. The US has a relatively small level of production of high oleic oil, approximately 55,000 tonnes/ with potential demand exceeding this level. However, information regarding the US industry is limited and production in Argentina is an unknown factor. Japan has contracted imports for use as a cocoa butter replacement in confectionery manufacturing.

In the medium term, with yield improvements and development of diverse species with high oleic oil content, Australian supply is likely to become more stable, as well as price competitive. Stable supply will enable a closer match between demand and supply than is currently occurring. Current demand is estimated at 6-9/000 tonnes, leaving a supply surplus of 7-10,000 tonnes. This inexacting match can be explained by the uncertainty of forward plantings and associated limits set by marketers on promotion and market development.

As volumes increase, combined with yield improvements, prices may decrease, whilst still providing competitive net returns to growers. Consequently, high oleic oils are likely to become price competitive to palm oil and other competitor products, such as cottonseed. It is under this scenario that high oleic is likely to make significant in roads into palm oil replacement.

An alternative view has been by proposed by some industry participants that high oleic oil should be positioned as a premium product, with emphasis on health, rather than functional, properties. Given the nature of industry development to date and investments made, such repositioning is unlikely to occur. Despite this, by improving agronomic properties and displacing palm oil, high oleic sun is likely to become an important and high value segment of the oilseed industry. However, for emerging oil types, it may be appropriate to assess oil types in terms of where

there are opportunities to add value along the supply chain. This is discussed further in the section on positioning.

Recommendation 1

The AOF should encourage research which prioritises yield improvement in high oleic sunflowers.

Globally, high oleic oils and other diverse oil industries are at an infant industry stage of development. The opportunity exists for the Australia to become a world leader in production and marketing of high oleic oil and diverse oil types generally. Australia can develop a dominant position a in the world market through utilising "first mover" advantages. Other industries and countries which have utilised this strategy to their competitive advantage are New Zealand with kiwi fruit, originally Chinese gooseberry, Australia with wool and Canada with canola, to name a few.

Recommendation 2

The AOF and the oilseed industry are in the position to take a strategic position in the world industry for high oleic oils and speciality oils in general. The Australian industry can achieve this by undertaking the following strategies:

- *register a harmonised name developed by the industry internationally (this may not be possible due to patents);*
- *the AOF aim to become the leading source of world information; and*
- *the industry utilise this information to develop market opportunities and production plans to capture those opportunities.*

This approach involves signalling to the world Australia's knowledge and interest in the industry and then develop plans based on Australia's information advantage. Success will stem from combining this strategy with that of coordinated information within the supply chain, enabling Australia to respond meaningfully to opportunities.

The consequence of developing such a strategy may be a move away from commodity exports to value adding. Australia generally exports surplus production in the form of seed. Australia's need for multi-purpose crushing plants and logistical constraints, due to the distance of facilities from production areas, tends to make Australian oilseeds uncompetitive as a processed product in commodity markets. However, if industry development moves in the direction of higher valued markets or specialist crushing facilities, Australia may well be in a position to export value added oilseed products.

Discussion

The industry utilise ACOR, and/or like facilities, to crush and process small commercial quantities of speciality oils for research and to facilitate transition from research to commercialisation for speciality oils.

Implementation of market access policies will have the major impact on the potential of Australia to export high oleic seed, oil and oil products. The General Agreement on Tariffs and Trade (GATT), a multilateral trade agreement signed in 1947, provides a set of rules and procedures ordering international trade, which is driving this issue. The Uruguay Round of GATT negotiations

accepted the Dunkal package for agriculture, which contained commitments on reductions in support in the three areas of market access, domestic support and export subsidies, being implemented over six years form 1993 to 1999. All indications are that the Multilateral Trade Organisation (MTO), responsible to implement the Uruguay Round of GATT, will be relatively successful.

Recommendation 3

The AOF needs to monitor developments under GATT affecting world trade. This should include monitoring and keeping industry updated on current agreements, participating countries and progress in implementing tariff reductions.

In relation to development of new oil types, some of these will be in non food markets or niche markets in which mainstream players in the oilseed industry may not be involved. However, in both cases, growers will reap benefits (as do others in the supply chain) and thus, will build confidence in the broader industry. The role of the AOF is to develop the oilseeds industry to benefit of its constituents. The corollary to this is maximising total benefits. Resources need to be allocated with benefits and beneficiaries in mind. Thus, there may be differences in criteria for allocation of funds derived from various sources, namely ODF, GRDC and others.

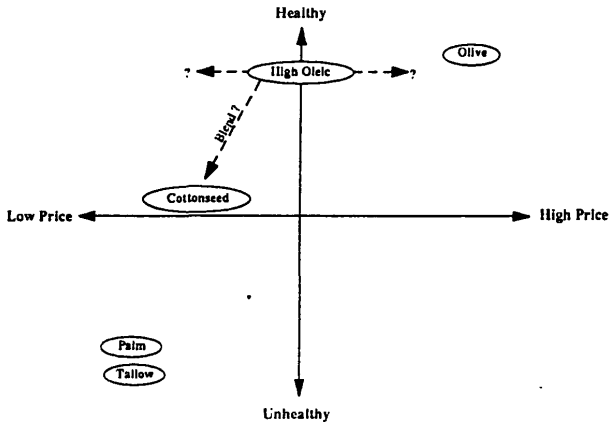
Recommendation 4

The AOF needs to evaluate industry development plans/proposals on the basis of benefits and beneficiaries, to ensure optimum benefit to a maximum of beneficiaries.

Positioning

The issue of how best to position high oleic products in the market place has been raised by a number project participants. The solutions proffered have fallen within, either one of two, opposing dichotomies. One, being to position high oleic products at a premium, based on health benefits and, the other, being price competitive positioning based on cost and functional properties. Relative positioning options are illustrated in Figure 6.

Figure 6: Positioning Options for High Oleic Oils



However, market forces will likely to determine the most profitable positioning strategies for individual players. Positioning is likely to vary amongst the retail, food service and industrial market segments, depending on the whole "package" of product attributes needed, such as packaging, service, security of supply and price. Such positioning, will enable a range of price discriminating policies to be employed, which is currently the case.

The opportunity does, however, exist for the industry, as a whole, to actively promote the health attributes of high oleic products and by doing so enhance the positioning strategies of the product.

Recommendation 5

Incorporate high oleic oil in the AOF/refiners market promotion activities to build on the health positioning strategies, whilst at the same time providing an image anchor product for oilseeds in general.

Consumer Confusion

Consumers, in the majority/are confused as to the role, benefits and relationships between saturated fats, poly-unsaturated fats and mono-unsaturated fats and more recent concerns such as transfatty acids. Whilst there is ever growing interest and concerns about health issues, there is a large knowledge gap on how best to address these health concerns. This is compounded by the ever expanding range of products available in the retail market.

Expansion of consumer knowledge is important to encourage growth of the high oleic oil industry. It is also likely to expand current market segments, enabling greater use of marketing mix variables to develop differentiated positioning strategies. In other words, it is possible at the moment that consumers lack the necessary knowledge to discern variations in health quality attributes between products and, consequently, group all non dairy products as being equally healthy and decide on the basis of price alone.

This is an issue for the oilseeds industry as a whole. The problem is only likely to compound, as more speciality oils are developed. A program of education and associated repositioning should be considered on the basis of a win/win situation for all oilseed products.

The National Heart Foundation (NSW Division) has undertaken a project entitled "Takeaway Food Project" aimed at widening and consolidating the reach of information about best cooking practises for hot chips. This included developing guidelines for takeaway food shops on the most desirable oils for frying.

Recommendation 6

Consumer demand, particularly at the retail level, is likely to constrain industry development. Consumer knowledge is not equal to the range in choice available. Education of consumers should, outwardly, be focused on increasing knowledge of the health and functional attributes of the range of fats and oils available. The outcome of this activity should be focused at redefining

the market segments established by marketers and reducing the level of price quality trading undertaken by consumers. The Heart Foundation should be consulted on this program and a alliance formed where possible. The focus of this program should be to aid all oilseed based products.

Mediums used should be targeted at for direct education. This could include pamphlets, package labelling and "in-store" promotions.

Consumer education would need to include:

- *differentiating saturates, mono-unsaturates, poly-unsaturates and trans fats;*
- *explaining the meaning of omega fats and relationship to other terms;*
- *reinforcing the unhealthy attributes of saturated fats;*
- *creating awareness of the use of fats in food service and the potential for use of "healthy" oils; and*
- *be simple with the main points possible to identify rapidly.*

Naming / Standards

This issue has two components – firstly a common name for marketing; and secondly standards to define high oleic, mid oleic and other emerging oil types and appropriate names.

Common Name

Uniformity of labelling is an integral part of developing a differentiated positioning strategy. It enables concentrated promotion of the health and functional benefits of high oleic products. The development of a uniform name and subsequent promotion has been successful for canola, an oil content enhanced rapeseed. High oleic oil products are currently known by the brand names "Mono Sun" and "Sunola" and there has been agreement regarding common terminology such as mono-unsaturated sunflower oil. Both of these former names have strong associations with sunflowers and "Sunola" possibly implies an association to canola. As discussed previously, the industry must consider the issue of products being aligned to species or to the inherent oil content.

This uniformity of labelling is an issue for the whole marketing chain, not just end users. Uniformity should be considered on the basis of creating a common language for breeders and growers, as well as for marketers and consumers.

Recommendation 7

Given the level of consumer confusion concerning types of fats and oils, it must be considered an imperative for the industry to develop a common name for high oleic products, while at the same time protecting the integrity of that name.

All elements of confusion should be eliminated. This can only be achieved through taking a "species" name approach. For example, high oleic canola is not a canola, the same way that canola was not named as a variety of rapeseed.

This issue should be referred to the AOF standards committee for discussion in consultation with the marketers.

Standards/Labelling

Integrity comes with supporting the name through standards, such as the current standard that high oleic seed must contain more than 80 per cent oleic oil. The development of speciality oils with similar, but differing oil contents, will impinge on positioning strategies and the integrity of high oleic oil.

Mid oleic oil is a contemporary example. The industry, in assessing the future of mid oleics, must assess their impact on the development of high oleic products. It is likely their existence and promotion under similar terminology dilutes the competitive advantage of high oleic products. Given the current level of consumer confusion, both the risk of damage and the impact of damage, to high oleic industry development, is substantial.

Recommendation 8

The AOF must develop and administer strict standards to ensure truth in labelling and to support the name/s developed. This would in turn disassociate the mid oleics from high oleic products. This issue should be referred to the AOF standards committee.

The definition of mid oleic has evolved to broadly relate to products which have less than 80 per cent oleic acid and greater than 10 per cent linoleic acid. Proponents of mid oleic oil advocate product benefits through enhanced flavour, which is achieved with a balance of linoleic and oleic acids at a ratio of approximately 20:70. However, the development of mid oleic varieties has been a natural consequence from moving along the continuum to high oleic. Their subsequent promotion and market potential has been questioned on that basis.

The essential question is do mid oleic offer differences and benefits to consumers? By taking such a marketing based view, it is possible to substantiate that mid oleics currently hold a substantial share of the oils and fats market, such as that held by canola, and consequently do not offer differences and benefits. Claims for promotion of these oil content products would appear to be product, rather than market oriented.

Recommendation 9

Whilst the future of mid oleic oils will be determined by the markets, the industry also needs to ensure that such market information is translated into meaningful responses by researchers. The AOF can do this by acting as a conduit between the market and researchers, assisting the development of pragmatic research goals.

The industry needs to be aware of the potential to market commercially the production from crop trials. This is an important issue in terms of the potential for contamination of high oleic oils by "mid oleic" oils from trial crops.

Recommendation 10

The AOF Standards Committee must ensure that trial crops produced are segregated on an appropriate oil content basis.

Pricing

Pricing of high oleic sunflower is currently based on a premium to linoleic sunflowers. It is likely that marketing of high oleic canola, in the initial stages at least, would be on a similar basis. However, if product differentiation became oil content based, associated pricing mechanisms would likely operate on the same basis. Price equilibrium would be driven by supply and demand for high oleic oil, as opposed to that of the underlying species.

Discussion

This issue does not require action by the industry, as the operation of free markets will evolve the most effective and efficient pricing systems for high oleic oils.

The research undertaken revealed a lack of understanding, by some growers, as to how markets operate. Increased knowledge is likely to lead to more informed, and professional, market decision making by some growers, who currently rely on the advice of crushers/ traders. As these advisors are market stakeholders, movements contrary to advice given can be judged as biased. Improving the level of knowledge, of some growers, would enable them to have confidence in, and take responsibility for, their marketing decisions. The combination of increased trust of other entities in the marketing chain, and more profitable marketing decisions, is likely to improve the image of the industry, increasing production and consequently industry growth. This conclusion is supported by a number of innovative growers being well informed and confident in, and satisfied by, their marketing decisions.

Discussion

Development of a grower promotional package which includes information on how markets operate. This recommendation is described fully in the sub section entitled Competitiveness On Farm.

The potential of long term contracts to improve supply has been promoted during some stages of research. The benefits from such contracts between growers, crushers and processors are likely to be improved planning and more consistent supply. On the other hand, such benefits are only likely to be important in these early stages of development, where small volumes can be more greatly impacted by shocks, increasing supply volatility. Again, a free market approach would suggest development of long term contracts will evolve if they provide commercial benefits. Information flow along the supply chain can also compensate for long term contracts, by providing the same outcome sought being increased forward planning, which in turn would reduce supply volatility.

Discussion

Recommendations incorporating this issue are made in Recommendation 17.

Production Related

Production Volume

Throughout the research, supply has proven to be the major restraint to growth. Current supply is restrained seasonally to the summer production of sunflowers and regionally to the more northerly production areas of eastern Australia. The early season sunflower crop is the most reliable and projected plantings are used by crushers and marketers in their forward planning. However, the late season crop, predominately grown in Central Queensland, is deemed uncertain by crushers and marketers and, as a result, is regarded as opportunistic and, consequently, is not included in planning. This is one of the reasons for the disparity between production volumes and current market size for high oleic oil.

The current lower yield levels of high oleic sunflowers, relative to linoleic, is not a constraint to volume, but rather to price. The major factor impacting on volume of production is the area planted, which will not be adversely effected, as long as premiums compensate for yield reductions. However, those premiums do considerably effect the price of the end product. At a 40 per cent yield, the current early season premium of $85 tonne increases the price of oil by $213 (AUD) per tonne.

The issue of volume has three components which need to be considered by the industry:

- the actual level of production;
- the variability of that production; and
- the seasonal spread of production.

Diversification of the range of crop species producing high oleic oil will be a primary factor to increasing supply, stabilising total variability and ensuring annual supply consistency. The crop most likely to contribute to this will be high oleic canola. This will provide a spread to existing production regions and seasons, with canola being a winter production crop grown in the more reliable southern regions. High oleic canola is also likely to provide logistically oriented benefits through closer proximity to existing crushing facilities.

Recommendation 11

To aid market development, the industry needs to target production in predictable production areas, whilst at the same time encouraging development of new high oleic species, such as canola. The former requires efforts on two tiers, pricing and promotion. Pricing being the financial incentive to grow high oleic sunflowers and promotion being support information, which is not currently available, such as market information and independent variety evaluation. Such promotional activities will also promote production in predictable areas in two further indirect ways. Firstly, by increasing awareness of the crop and, secondly, providing innovative farmers with information to assist them to act as opinion leaders.

Sunflower growers in Central Queensland expressed concern as to the possible erosion of the their high oleic market by high oleic canola. However, the contrary is more likely to be the case. The provision of relative stable supply of high oleic oil, from winter production which is harvested in the second half of the year, is likely to stabilise the market for late season sunflowers. Such stabilisation will enable marketers to plan for supplies in the second half of the year, facilitating demand, of which late season sunflowers can be a contributor. The one caveat being the development of non species aligned blends of high oleic oil, either at the exclusion of, or in concert with, species aligned products.

Recommendation 12

Further to the Market Development recommendation, regarding research into yield increases, the AOF also needs to supply information to sunflower growers as to the positive potential impact to their current market, from the development of high oleic canola.

Varieties

Whilst there is agronomic information available on high oleic varieties, there is very little independent evaluation of varieties. Consequently, it can be difficult for growers to make informed decisions, in terms of varietal choice. Participating growers suggested that independent crop trials would assist in their planning. This specifically relates to yield performance and oleic oil content. Other agronomic information is widely available, given the identical factors of production to linoleic sunflowers.

Recommendation 23

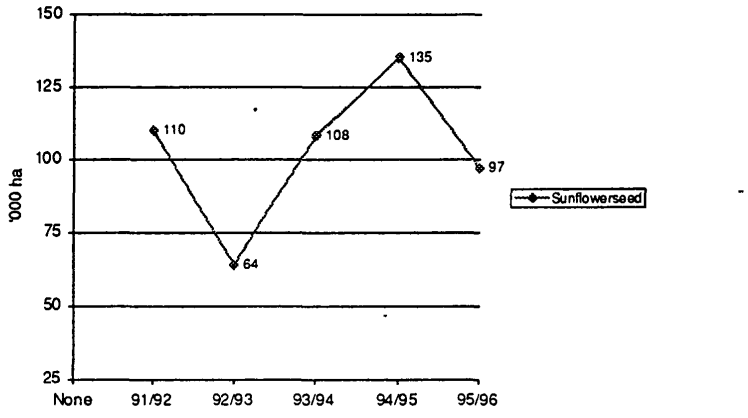
The AOF should encourage private breeding companies to release varieties for use in agricultural department trials or to cooperate in independent evaluation of trial results. Commercial trials on farm would increase pragmatism of results to growers.

Competitiveness on Farm

Grower Decision Making Factors

The industry needs to be aware that production premiums will influence the choice of sunflower variety planted, but may not effect choice of species grown. Growers, generally, will choose forthcoming cropping enterprises, within the constraints of their crop rotation, on the basis of net return. Selection criteria may be further complicated in low or high risk rainfall areas by the timing of rains, with growers in Central Queensland likely opt for a low return crop if early rains enable sowing of that species, rather than waiting to plant sunflowers and miss a planting window. This is unlikely to be an issue in the short term, as there exists a large enough sunflower planting area for high oleic substitution. Hence, choice will be on variety alone. However, as the industry grows, incentives to grow the high oleic sunflowers need to be competitive to the full range of alternative crop species. Sunflower production area over recent years is illustrated in Figure 7.

Figure 7: Sunflower Production Area



Source: Oil World Annual, 1996

Discussion

The AOF work in unison with crushers and refiners to monitor plantings and relative returns of high oleic sunflowers compared to competing crops. This information can be used in industry plans to encourage production. This is included in Recommendation 6.

High Oleic Image on Farm

Markets and products all can be effected by emotive based decision making based on image and perception. So too, can production choices of growers. Much research into diffusion of innovations and adopter categories has shown farmers rely on information by other farmers, opinion leaders, in making their decisions. Research during this project shows other farmers to be a major sources of information. Such behaviour also leads to "fashionable" behaviour. Currently, canola is a very fashionable crop to grow. These views can impact on the crop selection decision making process, influencing the weightings given to the two major decision criteria of net returns and crop rotation constraints.

The industry can utilise this to encourage industry growth by identifying the core elements which make the crop attractive to grow and promote those elements in the most appealing form. The aim being to promote industry growth, by increasing its rate of adoption by growers. Such an approach requires utilising the characteristic needs/ attitudes, interests, behaviour, demographics and media habits of different adopter categories to facilitate growth. Current production is undertaken by innovators with the goal being to utilise these opinion leaders to encourage production by early adopters and subsequently the early majority of adopters.

This may involve greater dissemination of information on end uses to groups such as the food media. As exposure expands in this sector, it will flow through to the rural media and growers. This will serve to develop a innovative and healthy image of the product and growers will want to be part of a new and vibrant industry.

Recommendation 14

Grower education should be undertaken in the context of increasing propensity of growers to plant high oleic sunflowers. Identification of the elements likely to make the crop attractive to grow should. be undertaken, which could include:

- *information on net returns (not all growers are aware that premiums compensate for yield decreases);*
- *crop support;*
- *facilitating the ease of information sourcing;*
- *"Top Market", a top crop like system to ensure maximisation of potential crop value through marketing efforts;*
- *supply chain information (provided in information communication strategies);*
- *consumer education material; and*
- *stories on end uses.*

To influence grower choice, a number of communication mediums are likely to be used, including:

- *a written promotional package;*
- *extension meetings;*
- *variety trial field days;*
- *media promotional activity during pre planting period to influence grower crop choice;*
- *encouragement of food writers to assess and publish the benefits of high oleic oils, this*
- *image will flow back to growers; and*
- *the AOF newsletter incorporating information on high oleic oils.*

Opportunistic Production

Concerns have been raised that the current price premiums may be encouraging the entry of opportunistic growers. Whilst this may be the case, it is only likely to be a short term phenomenon. This is because, exploitation of price premiums for easy profits is unlikely, as it also requires bending the yield curve which is only likely to be achieved by experienced and committed growers.

Whilst entry of opportunistic growers is unlikely to directly impact on production, in terms of quality and quantity, it may have a negative impact on the image of high oleic sunflowers. As these growers lack the experience and commitment necessary for successful production, it is possible that they may exit with poor views as to the value of the crop to growers.

Discussion

Utilise a grower targeted promotional package to counter negative publicity from opportunistic growers. This is incorporated into the promotion package suggested in Recommendation 4.

Industry Related

Diverse Oil Types

The proliferation of diverse oil types under development in this country, and overseas, has raised concerns as to whether their development is market or research driven. This issue relates to all new oil type industries, not just the high oleic industry alone. Concerns need to be addressed from two aspects

- efficiency of resource allocation; and
- competitive impacts on existing species.

The focus the entire oilseeds industry has placed on crop species may be leading the development of a large number of crops with similar oil contents. Again, this issue may be clarified through taking an oil content viewpoint as opposed to that of species.

Research that offers benefits to an oil based industry, such as high oleic sunflower, should be deemed beneficial. A good example being the breeding of high oleic canola to expand quantity and uniformity of high oleic oil supply, through a regional and seasonal spread of production. Analysis of the value generated from different breeding programs needs to focus on the components of oil content. The contribution of species should be considered in terms of supply of the intrinsic product.

Discussion

The AOF needs to monitor research and circulate information to industry. The AOF needs to respond on a by exception basis where research is contrary to industry best interests.

Patents or licenses

Protection of intellectual property is considered a critical issue. Due to the cost of development, breeders need to ensure reasonable returns. The basis will vary depending on contractual arrangements between breeders and crushing facilities. Where there are no contractual arrangements, there is a need to protect intellectual property. Rapid and reliable fatty acid testing at point of receival would protect illegal plant use, as all varieties have unique, thus traceable, fatty acid profiles. Plant Breeders Rights (PBR) become less of an issue where crops are developed with contractual arrangements in place, as these make it difficult for outside seed to enter the supply chain.

Recommendation 15

The industry needs to encourage development of point of delivery testing devices, which not only will protect PBR, but will also ensure segregation and truth in labelling.

Recommendation 16

The industry also needs to confirm the current worldwide situation regarding ownership and access to patents. Whilst not a major issue to industry development, given the current level of breeding activity, the industry needs to monitor progress of developments to asses any changing circumstances which are likely to affect the Australian industry. There is a possible role for the AOF to undertake a watching brief on this situation.

Industry Structure and Control

Growers have expressed concerns of potential for market manipulation by downstream entities in the marketing chain. These concerns can be alleviated by assessing the oilseeds industry as a contestable market. Although the market appears to be highly concentrated, and, therefore to lack competition, the possibility of potential competition forces incumbent companies to act in a competitive manner. This is based on the fact that other entities are free to enter and exit downstream oilseed industry sectors, if they so wished, to either earn value added profits or to force current organisations to act competitively.

These concerns, of market manipulation, have also been raised based on contractual arrangements between seed companies and crushers. Whilst this also increases the level of industry concentration, the market remains contestable.

The current alliance between some plant breeders and crushers/traders, whilst commercially sensible, also enables closer communication between those parties. This facilitates efficient crushing economies and through chain planning, which in turn is likely to grow the industry in unison with demand and reduce the risk of "shocks" through oversupply. This approach also provides the mechanism for premium positioning, as discussed earlier, through ensuring unique product attributes (species or variety) that are not easily imitated.

Discussion

Similar to the issues discussed under Pricing, the development of promotional material aiding grower understanding of the high oleic industry and the operation of associated markets, would be beneficial in increasing trust between industry entities, through knowledge, and as a result contribute to industry growth. Specifically included in Recommendation 4.

Through Chain Planning

Agricultural commodities have been characterised by boom bust cycles. This is often amplified over time in line with increasing production. Through chain planning can minimise the development of boom bust cycles by ensuring demand matches supply.

Processors contract their requirements for high oleic sun oil for the coming season with crushers. The premiums required to encourage production is recommended by crushers and is passed on in full from processors to growers. Beyond this level, industry growth and profitability may well be constrained by a lack of through chain planning.

Through chain planning can be assisted through the gathering and communication of information from the different industry sectors. Such information can act as a surrogate to long term contracts to ensure market equilibrium in supply and demand, and with export opportunities. Every industry sector stated a lack of information was constraining decision making, both domestically and internationally.

It is recognised that some of this information may be deemed to be commercially confidential and thus, AOF may be able to play the role of collating and disseminating this information to remove any commercial sensitivities, as it has done in other cases to date.

Recommendation 17

Two components that need to be planned are sourcing of information and communication medium.

As industry participants benefit from the information provided by other sectors, each sector should be responsible for sourcing information on the activities of its sector, each being rewarded by the contribution made by other sectors. At the grower level, this may involve information sourcing at a peak body level due to the large number of growers.

The AOF needs to consider utilising the current AOF newsletter as a communication medium or developing new systems for high oleic industry communication.

Information that needs to be communicated along the supply chain would include:

- *gross margins for high oleic and competing crops;*
- *planting plans of growers for the following season;*
- *independent yield trials of high oleic varieties and progress of yield increases;*
- *progress in development of brassica crops, including oil content and yields achieved;*
- *seed availability for the coming season and match to planned plantings;*
- *export seed opportunities and quantities;*
- *anticipated end use demand; and*
- *anticipated exports of finished products.*

Whilst it must be recognised that this information is currently being communicated to the next entity in the system, it is not passing any further. Transfer of this information throughout the chain leads to an "industry" culture likely to increase combined efforts to encourage industry growth.

Sunflower Logistics

Sunflowers have historically experienced logistical problems with the major production areas being in northern NSW, southern Queensland and central Queensland, whilst 85 per cent of crushing capacity is located in NSW and Victoria. These logistical issues have also related to the situation of two crops, early and late, and subsequent oil quality variations that occur. Consequently, there have been years where it has been more economical for crushers to import sunflower oil from South America into Victoria and export sunflower seed out of Queensland.

Discussion

Sunflowers, for this reason, are always likely to be constrained by these added logistical costs. From an industry perspective, the development of southern production area brassica crops such as high oleic canola, will improve the cost structure of high oleic oil. The recommendation has been detailed, underproduction Volume, resulting in recommendation 11.

Segregation

Segregation is an important issue to underpin the development of a uniform name and truth in labelling. High oleic sunflower seed cannot be identified visually from linoleic seed. This has led to calls for the development of seed coat markers and oil content testing devices at point of delivery. However the real, and most pressing, issue is to maintain segregation. Growers surveyed have been confident in their segregation procedures, mainly due to the differing harvest times of the two variety streams and through immediate delivery procedures utilised for high oleic sunflowers.

The industry needs to be aware that development of speciality oil types increases segregation needs and consequently the infrastructure and procedures required. It is only a matter of time, for instance before canola will need segregating by three categories, linoleic, high erucic and high oleic.

Recommendation 18

The following actions are recommended to ensure segregation integrity.

i) The AOF standards committee develop and set standards for through chain production, segregation and handling protocol.

ii) The AOF standards committee investigate the opportunity, benefits and costs of developing and regulating a through chain quality assurance system.

iii) Investigate opportunities for the development of a receival point testing device and/or system for ensuring fatty acid profiles meet labelling standards. This point is covered in Recommendation 15.

Crushing

There is currently a reasonable correlation between oilseed production and crushing capacity. Comparison of oilseed production and crushing capacity on a state basis is shown in Table 3.

Table 3: Comparison of Oilseed Production and Crushing Capacity on a State Basis in Australia, 1987/88 to 1995/96 ('000MT seed)

Region	Oilseed Production			Crushing Capacity			Prod - Crushing Capacity		
	1987/88	1991/92	1995/96	1987/88	1991/92	1995/96	1987/88	1991/92	1995/96
QLD*	338	291	324	140	140	210	198	151	114
NSW	451	724	697	470	490	660	(19)	234	37
VIC	48	44	226	130	140	220	82	96	6
SA	12	17	64	15	15	20	(3)	2	44
WA	4	15	126	12	15	30	(8)	0	96
TOTAL	853	1091	1437	797	800	1140	56	291	297

Source: White, 1996

As the production of specialty oilseed crops increases/ they will be competing with mainstream oilseeds for crushing capacity. Whilst adequate crushing capacity currently exists, specialty oilseeds which have limited production potential (albeit possibly high value niches) may not successfully compete for crushing capacity. The reason being that specialty oilseed will, in the majority, be relatively small in volume requiring extra segregation at plant and short runs, which to do not match the scale economies generated by larger mainstream oilseeds.

It is possible that specialist facilities will develop for the crushing of specialty crops. This is likely to enhance the range of oils processed and provide potential export opportunities for value added specialty products. However, diverse oils also have potential to fragment the industry. In recent times, the industry has consolidated with higher levels of concentration in the crushing sector, encouraging a more efficient industry through higher levels of throughput, a closer match between production and crushing capacity and increased through chain planning. The industry needs to be aware of the risks and benefits associated with the likely development of specialty crushing plants.

Discussion

Investments relating to crushing and other processing facilities will be driven by individual perceptions of the commercial returns likely to be achieved. AOF has included updates of crushing capacity as part of its information package disseminated to the industry and should continue to this.

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Appendix 1 Gross Margin Analysis

Gross margin surveys have been analysed to identify incremental differences in production between high linoleic and high oleic sunflowers. The incremental factors affecting the relative net returns from the two varieties are shown in table AI, in terms of high oleic sunflowers.

Table AI: Relative net returns

	Liverpool Plains	Darling Downs	Central Queensland
Revenue			
Price Premium Paid*	$85/t	$85/t	$50/t
Yield % Increment!	-20%	-20%	-10%
Variable Costs			
Seed	+19%	+19%	+19%

** based on 1996 premiums. ! based on seed company data. Departments of Agriculture estimates and grower data.*

Note: The use of on farm prices have eliminated the need include freight cost increments.

Production Indifference

Grower choice, based on net returns, between the production of linoleic and high oleic sunflowers depends on the degree of compensation received, for decreased returns and higher costs incurred in high oleic production, from the premiums offered. This has been ascertained by solving a simultaneous equation for a premium, based on the incremental factors of production, where a producer would be indifferent to the production of high oleic or linoleic sunflowers. The equation and solution are given below.

$GMH = YL/r * (PL + X) - (VL + S)$

$GML = YL*PL-VL$

Where:

- GMH = gross margin high oleic sunflowers
- GML = gross margin linoleic sunflowers
- YL = yield linoleic sunflowers
- r = per cent yield reduction of high oleic
- PL = price per tonne for Linoleic sunflowers
- X = premium
- VL = variable costs linoleic sunflowers
- S = incremental seed cost increase for high oleic

Therefore:

$YL/(1 + r) * (PL + X) - (VL + S) = YL * PL - VL$

Price, yield and seed increment can then be substituted for PL, YL and S enabling the equation to be solved for X. These variables are assumed at:

PL = $335/t

YL = 1.6t/ha Liverpool Plains
= 2t/ha Darling Downs
= 3t/ha irrigated Darling Downs
= 0.9t/ha Central Queen

S = $5.40/ha at 2.7kg/ha Liverpool Plains
= $6.00/ha at 3kg/ha Darling Downs
= $10.00/ha at 5kg/ha irrigated Darling Downs
= $5.00/ha at 2.0kg/ha Central Queensland
@ price difference $2.00/kg

The premium required for production indifference is shown in table A2.

Table A2: Premium required for production indifference

Region	$ / tonne
Liverpool Plains	71.05
Darling Downs	70.60
Darling Downs - irrigated	71.00
Central Queensland	39.61

The sensitivity of the premium required, due to changes in yield, is shown in table A3.

Table A3: The sensitivity of the premium required

Region	% A yield reduction	% A premium
Liverpool Plains	1	5
Darling Downs	1	5
Darling Downs - irrigated	1	5
Central Queensland	1	9

Appendix 2 Grower Qualitative Survey Findings

Production Factors	Liverpool Plains	Darling Downs	Central Queensland
Decision to grow	Prices Acreage contract available	Price Quick maturity = 1 water for irrigated crop New crop	Price Sunflowers traditional crop - evaluate potential
Production difficulties	Yield loss Weak seedling vigour Specific harvester front	Yield loss	Yield Heat damage on emergence (as later planting to linoleic)
Alternative crops	Dryland cotton Sorghum Linoleic sunflowers Maize	Cotton Corn Sorghum Linoleic sunflowers	Sorghum Mung beans Linoleic sunflowers
Performance relative to alternatives	+ low rainfall + price stability Erosion and om* Nutrient depletion Information available Yield risk	+ low rainfall Birds Yield Erosion and om* Germination	+ returns + pests (locusts) + low rainfall Yield Germination Yield loss Contracts Seed availability Erosion and om*
Rotational factors	+ grass weed control + no tillage + tap root aerates soil + can defoliate for weed control + large planting window + low trash Erosion Best after cereal Broadleaf weed control	+ grass weeds + early maturity Erosion Best after cereal Broadleaf weeds	goal to maximise planting opportunities + last crop eaten by locusts Erosion Best after cereal Runoff and soil moisture intake
Segregation difficulties	None Different harvest time to linoleic Immediate delivery off farm or sufficient storage	None Different harvest time to linoleic Immediate delivery off farm or sufficient storage	None Different harvest time to linoleic Immediate delivery off farm or sufficient storage
Sources of advice	Seed company rep Merchandise agronomist Agronomist Other farmers	Research trials Agents Department of agriculture Other farmers	Seed company rep Consultant Agents Field days Traders
Information needed	Why less yield? Price forecasts End uses and benefits Marketing Contact with end users	Information to consumers Seed sales Trading information Trial information Production practises Market information	Market information Consumer information Production research Market forecasts Follow up information On market shocks

* *om stands for organic matter*

Appendix 3 High Oleic Products Summary Matrix

Summary matrix of high oleic products by market segment in terms of market opportunities, strengths and weaknesses.

Segment	Product applications	Market/opportunity	Strengths	Weaknesses
Retail	Spreads	Value $420 m* Mature Static	Health No rancidity Price competitive to olive oil	Price Undifferentiated perception Supply
	Dressings	$75.70 m^ Shrinking	Health Shelf life Dual purpose frying & dressing	Price Supply
	Cooking oils	$143.50 m* Stable	Health Frying properties Dual purpose - frying & dressing	Price Supply Not much frying at home
Food Service				
	Frying oil	$95 m# Growing	Health Frying properties deep & shallow Pourable Comparable fry life Dual purpose frying & dressing	Price Supply Package disposable Package cost
	Salad dressing	$177 M#	Health Dual purpose - frying & dressing	
Industrial				
	Frying oils Formula ingredient Spray oils	$210*m!* 2% growth pa Unknown Growing	Health Frying properties •product shelf life Oil shelf life Health Longer pack life	Supply Price (not major)

•Source: Industry source

** Source: Foodweek, December 3,1996*

^ Source: Meyers Strategy Group Research, 1995

 # Source Meyers Strategy Group Research 1994

Appendix 4 Competing Products Summary Analysis

Summary analysis of competing products by segment in terms of strengths and weaknesses.

Product application	**Competing products**	**Strengths**	**Weaknesses**
Retail			
Spreads	Linoleic sunflower Canola Olive oil Butter Blends	Blends - flavour Blends - growth 9.9%* Olive - image Canola - oleic and omega 3	Blends - saturates Olive - price Canola - shelf life
Bottled oils/ dressings	Blended vegetable oils Canola Olive oil Linoleic sunflower Specialty oils	Canola - oleic Olive oil - image Vegetable oil - price	Olive - price Canola - shelf life Vegetable oil - poly unsaturates
Food Service			
Frying oil	Palm Tallow Cottonseed Hydrogenated vegetable oils	Palm - price Palm - packaging Tallow - price Tallow - flavour Cottonseed - < saturates • cottonseed -pourable Hydrog. - price and < saturates	Palm - saturates Palm - solidified Tallow - saturates Cottonseed - saturates Cottonseed - packaging Cottonseed - fry life Hydrog. - free fatty acids
Salad dressing			
Industrial			
Frying oils	Palm Tallow Cottonseed Hydrogenated vegetable oils Olive oil	Palm - fry life Cottonseed - price	Palm - saturates Palm - rancidity Cottonseed - can solidify in tanks etc. Cottonseed - > rancidity Cottonseed - flavour not as good Olive oil - price Olive oil - flavour wrong • olive oil - batch supply differences
Formula ingredient	Unknown	Unknown	Unknown
Spray oils	Poly-unsaturates	Price	Health Shelf life

* *Source: Foodweek, December 3,1996*

Appendix 5 Current Species Based Research for Enhanced Oil Content

Current Species Based Research for Enhanced Oil Content

High Oleic Crop Species	
Commercial Developing	High oleic sunflower High oleic safflower High oleic canola High oleic peanuts Genetically engineered high oleic canola Genetically engineered high oleic Indian mustard Genetically engineered high oleic soybeans
Mid Oleic Crop Species	
Commercial	Mid oleic canola
Low Linolenic Crop Species	
Developing	Low linolenic canola
High Erucic Crop Species	
Developing	High crucic canola
Other crop species being developed internationally	
	• high oleic corn • high oleic soybean • high lauric canola • high stearic acid soybean • high stearic acid canola • low saturates soybean • high palmitic soybean • low linolenic soybean • low linolenic flax

Appendix 6: Domestic Consumption

Total Domestic Consumption by Type, 1996

Palm	80,000
Tallow	70,000
Coconut	9,000
Soft Oils	*256,000*
Canola	100,000
Sunflower	50,000
Cotton	35,000
Soybean	50,000
Other	21,000
Total	**415,000**

(*Other includes peanut, safflower, maize and sunola)

Source: MeadowLea, 1997