RURAL INDUSTRIES RESEARCH
& DEVELOPMENT CORPORATION

Regional Australian Olive Oil Processing Plants

Feasibility study for network partners representing enterprises involved in olive production for the

Rural Industries Research and Development Corporation

By Meyers Strategy Group Pty. Ltd.

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A feasibility study commissioned by Rural Industries Research and Development Corporation to determine the feasibility for network partners representing enterprises involved in olive production for establishment of regional olive oil processing plants in Australia.

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Foreword

This report provides readers with both words and an excel model of the feasibility of processing olives into oil, in Australia.

It contains a detailed review of the steps required to establish a group of like minded olive growers, the rationale for the study based on the formation of a new marketing company in Australia to market quality olive oil and associated products in the domestic and export markets. The study was first proposed as a method of establishing how Australia could compete in a rapidly growing olive industry worldwide.

The report and financial model draws on actual experience to date as well as date from two major international olive processing companies. Alfa laval and Pieralisi.

This project was funded from RIRDC Core Funds which are provided by the Federal Government.

This report, a new addition to RIRDC's diverse range of over 600 research publications, forms part of our New Plant Products R&D program, which aims to facilitate the development of new industries based on plants or plant products that have commercial potential for Australia.

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Peter Core
Managing Director
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Executive Summary

A project to determine the feasibility for network partners representing enterprises involved in olive production for establishment of regional olive oil processing plants in Australia.

The rapid growth of olive tree numbers in Australia indicates significant quantities of olive oil will be available from domestically produced olives from around 2005. When considered against the increasing production of olive oil worldwide and the magnitude of the olive oil industry in the Mediterranean regions in particular, Australian producers are faced with several challenges.

The first of these is the potential market mix of imports and domestic production, how will the Australian industry manage this change? The second is that existing Australian producers are receiving very high prices for their very small volumes of Extra Virgin grades and these prices could fall from the high $25 range for a 500 ml bottle in specialty retail and delicatessens to between $5 and $10 a bottle. Next, is the opportunity to establish processing facilities with adequate capacity to process the rapidly increasing Australian Olive crop and to produce olive oil to match customers needs.

Australia imports around 23,000 tonnes per annum (value approx $87 million) of olive oil and consumes around 24,000 tonnes. Commercial, domestic oil production is limited but clearly there is considerable opportunity for the industry to embark on the process of establishment of strategically located olive oil processing plants with capacity to process large volumes of olives.

By 2006 Australia will have the capacity to produce up to 6750 tonnes of oil from 3 million producing trees. These plantations will be spread across Australia and oil production is likely to come from strategically located oil processing plants.

Current Australian producers and marketers of oil tend to be very independent individuals, the need to change this culture and form networks for growing, processing and marketing is becoming more and more evident. A word of caution for those wishing to embark on co-operative methods in establishing new structures, tree numbers are not the foundation of control, marketing expertise must drive any change and it must meet the customers needs.

The Olive industry in Australia has been well supported by significant contributions from Rural Research and Development Corporations for more than five years. There has, until now been no specific focus by RIRDC project work to look at the feasibility of establishing olive processing facilities. Early in 2000, Gwydir Olives Pty Ltd approached RIRDC to seek support funding to complete a feasibility, based on their own achievements and the concept of forming a national marketing venture for oil and olive products.

This report describes the critical factors to be considered in and feasibility of establishing regional plants for the processing of olives for olive oil.

The outcome of this project is a model for the establishment of regional plants for processing olives.

The report describes the costs and social benefits of establishment of regional processing plants for Australian olive processing and highlights the factors that will influence a successful operation.

A basic template for use by any enterprise considering establishment of regional processing facilities for olives is presented. The project emphasises the need for alliances to market olive oil domestically and internationally.

The researchers assembled data on costs of establishment of oil processing plants of various capacities, consulting with key suppliers of equipment to assess plant suitability.

This feasibility study covered all aspects of establishing a processing plant, from seeking local Council support and approval, to managing supply, establishing quality criteria, to storage and transport. Each activity was evaluated for cost implications and the figures included in the financial model included as an appendix.

Those wishing to establish their own processing plant could well save many hours of time, energy and dollars by careful reading of the material and making contacts with those who have so generously donated their expertise and practical experiences.

The project outcomes have been delivered to Gywdir Grove Olives Pty Ltd.

Method

Existing and potential olive production in Australia was mapped during the project and agencies such as equipment suppliers, Departments of Agriculture, local councils, development boards and environment protection bodies were consulted. A range of key factors, which could influence the locale for regional establishments, were listed for potential investors to consider. A financial model was developed to indicate the worth/value of a new processing facility.

Based on the formation of a marketing group in Australia, the model has identified that there will be a need for six more plants in ten years with total installed capacity of 19.6 tonnes per hour.

Lasting, long term benefits of the establishment of regional processing plants for olive oil production include the potential to reduce the volume of imported oil into Australia, regional employment in a new industry and longer term benefit of increased olive oil consumption which has the potential for health and nutritional benefits to consumers.

The study focused on processing olives into high quality olive oil, and does not contain information relating to refining unsuitable oils, nor chemical extraction of pomace oils. These product segments are seen as being areas where Australia should not try to compete, but to target the high end of the market where our natural ability to draw on the use of innovation would provide suitable competitive advantage over time.

1. Introduction

1.1 Rationale for the Project

In the first months of 2000, it was becoming apparent from Australian and international sources that the number of olive trees being planted could see a major change in the existing short supply of olive oil. If the projections are true, Australia would need to become a significant exporter by the year 2005, perhaps to countries who themselves were planting substantial numbers of olive trees.

Those olive growers who had trees in the ground and those who managed to produce oil, were part of a vision of an emerging industry where prices for a 500 ml bottle could vary from $25 to $65 and even more in some cases. Most growers saw the great success of Joe Grilli's 'Josephs' brand and put themselves in his league.

A Group of quality minded growers were of the opinion that their success in selling into this market could be enhanced by forming some type of alliance with other growers, especially those whose quality philosophy matched their own. Thus, a meeting was arranged in May 2000 where a decision was taken to form a marketing alliance to meet the challenges on the horizon.

Simultaneously, the same Group, Gwydir Olives Pty Ltd approached RIRDC with the proposal that they would undertake a study on the issues relating to establishment of an olive processing facility in Australia. The findings would be made public and the study would involve many of the emerging large growers in the Australian industry. A copy of the executive summary and methodology relating to the proposal is included as Appendix 1.

After consideration, RIRDC approved the study and it was agreed that a wide range of olive industry participants would be approached for their contribution. The list included state Departments of Agriculture, existing processors, olive groups, growers and associated industry support providers. It is fair to say that if the response is any indication of the industries cohesion and capability, then our future is not rosy.

Unfortunately many think that sharing information such as bearing and non bearing tree numbers is highly confidential. A copy of the questionnaire forwarded to potential participants is included as Appendix 2.

This report reflects the processes used to evaluate options for processing olives into oil. Readers may care to draw their own conclusions and act independently. The report is primarily for the use of those choosing to combine their strengths and survive.

On approval, the methodology was widened to include an internal financial model, provided to Gwydir and associates and two case studies were completed, one at Birdwood, 48 km west of Wauchope in NSW and the other at Boundary Bend Estates near the NSW Victorian border. These two sites will have a total of around 500,000 trees in the ground by end 2001 and thus are likely to benefit from significant economies of scale. A processing operation at either site can draw additional fruit from the surrounding area and increase economies whilst reducing competition.

The study team wish to acknowledge the contribution of the Gwydir Olive shareholders and the new shareholders in emerging 'Newco Olive Oil Marketing Company' * formed in September to take advantage of scale economics. Gwydir Olives played a major role in encouraging the formation of Newco, providing a considerable input in terms of technical and marketing information.

* Newco is the generic name used to describe the company. The trading name is yet to be formalised.

If this study can play a role in encouraging others in the Australian olive industry to form processing, marketing or fully integrated organisations, then the study team has achieved one of its key aims.

As part of our undertaking to RIRDC we would be pleased to provide clarification on issues raised in the report, to those choosing to make contact. The possibility of holding state by state workshops to discuss the findings should be encouraged, if there is any possibility of speeding up the process of individuals conducting their own feasibilities.

2. Forming Networks to Ensure Supply and Improve Performance

One of the key lessons learnt by the Gwydir shareholders more than six years ago, was that there is strength in volume and not competing against each other. The message has held true in the formation of the Newco organisation and it is appropriate to draw from other horticultural experience in developing networks to reinforce the critical imperative in the Australian industry, if it is to become competitive.

This section of the report has been drawn from our experience with two horticultural groups, one olives and the other, successful exporters of high value vegetables to two Asian countries. The Asian Group of vegetable exporters were supported by the Supermarket to Asia program.

The story of Gwydir Olives and its considerable commercial success has been used as a focus, to encourage other industry participants to follow their lead.

2.1 Introduction

When Gwydir Olives commenced operations six years ago, it drew on trees planted in Moree, Inverell and Narrabri. The 15 shareholders who formed the Company had a vision to produce high quality olive oil for both the Australian and export markets. Naturally, the growers saw their oil under the Gwydir Grove brand as high quality EVOO and commanding excellent prices in the segments such as specialty retail and specialty delicatessens.

The lesson learnt by the 15 proprietors have been woven into their business management and policy development and as a result Gwydir commands a great deal of respect in the industry today.

With the above background, Gwydir's Chairman Mac McCulloch, and Board of Directors approached several Australian emerging olive oil ventures with the thought that the benefits from co-operation in some form of network or alliance would deliver synergies and critical mass across many areas. These included buying bottles, cartons, labels and equipment. It could expand to processing where competitive advantage would ensure viability and staying in front on the rapidly expanding competitors entering the Australian market.

Having embarked on a strategic marketing review in February, Gwydir saw that the need to engage other olive ventures in a strategic alliance was now more appropriate and necessary, than ever before.

In May 2000, around 25 invited olive industry participants met at Inverell to identify what they had in common and how an alliance may be developed. Several models were examined and the success of the wine industry used as a benchmark.

The outcome of the Inverell meeting was a request to Gwydir to communicate further with other nominated olive ventures with a view of establishing a marketing company to sell high quality olive products, especially olive oil, under a common owned brand or brands.

It was agreed that a further meeting would be held in Sydney in late July, to establish the basis for a new venture as well as examining key strategic issues for achieving a successful outcome. A Steering Committee, was established under the direction of Mr Peter Birch, a partner in Gwydir Olives Pty Ltd and the Company volunteered to drive this opportunity.

2.2 The Opportunity Defined

As a result of the May 13 and 14 meeting at Inverell, the following outlines the logic for establishing a marketing venture:

"The workshop concluded with a unanimous decision regarding possible next steps which Gwydir Grove should facilitate, to bring about formal negotiations to establish a marketing company, in which

participants can purchase equity. Such a venture could be responsible for disseminating processing expertise, blending of final product for markets and generally managing the selling and marketing functions across an appropriate number of brands, controlled or owned by, the marketing company.

The brands would be strictly controlled by the marketing company. The proposal to provide packaged product for local use only, to strategic alliance partners, needs further qualification.

A seven point plan of actions was agreed by all present, and these are:

- develop and have signed a confidentiality agreement;
- develop a heads of agreement for participants, based on the thrust of the final discussions at Inverell;
- form a Steering Committee of Gwydir Olives and participants;
- develop a wish list covering the marketing company's focus and equity expectations;
- identify the critical needs of each participant, based on their own plans and expertise;
- define the rules of engagement in terms of size, location structure and achievements to date; and
- develop the above and other canvassed issues as a prioritised list and ensure that resources are available to achieve an effective decision making process.

Non disclosure agreements were sent to those participants and other invited ventures to ensure that the competitive advantage being developed is maximised. This step was designed to protect each party and ensure that confidential information was not leaked to competitors and that participants were genuine in their intention to join the network.

Gwydir Olives confirmed the Company's intention to invest in the proposed marketing company and to continue to share sensitive information with those who signed the non disclosure agreement.

Gwydir has invested heavily in developing the concept of high quality extra virgin olive oil as well as achieving its mark in the olive industry today. Scarce resources amongst the proposed participants demands that external services as well grower provided funds are required to develop business plans and other associated documentation.

In further discussions with participants it was noted that the independence of the marketing company as compared to owning all the factors of processing oil, needs to be stressed, as would the proposed ownership of suitable brands.

Another major consideration that was agreed, was the establishment and development of additional brands to position branded olive oil on the supermarket shelves and other market segments such as export.

This process would require a large investment by the marketing company and those funds were needed to commence investing in a retail brand, as soon as possible. Therefore a cash contribution (in the form of equity), from proposed participants and or alliance partners was agreed as one of the foundations of forming a new venture.

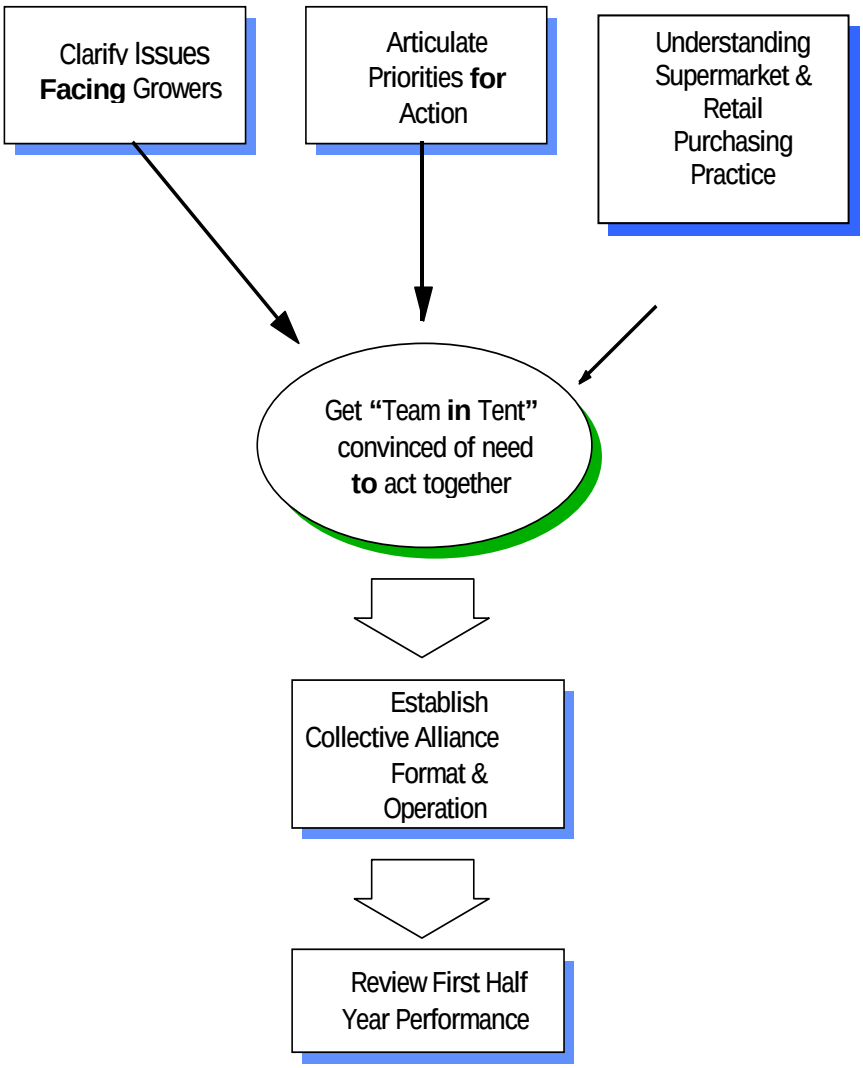
The figure below identifies the process which could be followed to establish grower networks, especially suited to ensuring that there is sufficient critical mass to make a processing plant sustainable.

Each step of the process is explained so that growers can be aware of the expected outcomes and how best to manage both the times and resources that are required to achieve success.

It is important to clarify that without some type of formal network in place to guarantee supply, that any new installation for processing olive oil will not be feasible. The one hundred per cent rule is critical to success and that is that growers provide 100% of their fruit and that the network accepts responsibility for 100 % of what is has to sell. Even if some of the olives or oil is used for industrial use or even has to be dumped. The return to growers would therefore reflect the quality of the fruit supplied.

Thus, Figure 1 depicts the initial work required to define the future potential.

Figure 1 — Stage 1 Network Establishment



2.3 Clarify Issues Facing Growers

The Olive industry has been the recipient of substantial funding from federal agencies such as the Rural Industries Research and Development Corporation and most state governments. Thus, there are a significant number of reports available to growers regarding agronomics, varietals and market opportunities.

To date, it appears that the average 'growers dream' of having their own grove, processing plant and brand, has not encouraged the formation of larger networks to achieve economies of scale.

It is recommended that growers should establish informal networks, find several critical points on which they agree and then work to formalise the structure to ensure that it has funding to achieve common goals.

Without matching dollar for dollar funds, Government will not provide additional research support as their requirements are being more and more constrained by financial outcomes for research projects.

The reference in Figure 1, to 'getting the team into the tent' is but a first step in ensuring that growers don't compete with their neighbours. Research completed as part of this study has identified that our

international olive competitors will literally drown Australia in low price olive oils. Thus, survival depends of early co-operation and in a highly professional and structured manner.

Today there are several grower groups and co-operatives in the olive industry, however, they do not ensure that 100 per cent of growers' fruit is provided to the one processor or marketing operation. Until growers cease to compete along the supply demand chain, they will never be well positioned against the invasive international olive oil countries.

Perhaps issues, which bring growers together initially, can include regional issues such as yield, production and harvesting techniques. Once there is agreement about these perhaps the possibility of recording data so that it can be included in a spreadsheet software package and each grower can be given their performance against the average. In any event, the tasks will initiate the sharing process and demonstrate that networking has many advantages.

Key Issues which growers need to consider in establishing viable olive network businesses include:

- selection of varieties;
- management of supply of fruit;
- production skills and management capability;
- quality management systems;
- variety and network support programs;
- market entry expertise and funding to support;
- marketing and selling expertise;
- branding and positioning;
- customer focus and research to ensure dynamics are understood;
- competitiveness addressed;
- industry planning and integration are effective'
- vertical integration is well understood and increasing;
- research and development is well funded by industry and government; and
- communication channels exist and are effective.

2.4 Articulate Priorities for Action

One of the outcomes from initiating an informal network will be the articulation of priorities for action. Managed well, this process does more to weld the grower group together.

A facilitator helps to overcome some of the natural inclination to hold back what may seem like confidential information. Networks in the citrus and apple industry were constrained because growers felt that they should not provide yield, returns or other pertinent information.

The growers in the Gwydir Olive organisation are successful today because they have never been constrained by sharing data. Their systems have been developed over the past six years and the result is demonstrated by the recent. Medal tally at the Olives Business 2000 seminar. From the point of entry to the processing factory at Inverell, growers fruit is monitored and all aspects recorded. Growers receive quality bonuses for high yielding fruit and are paid by the litre of oil produced not per kilo of olives delivered. These systems are constantly being upgraded and will assist the competitive advantage of Newco.

It is critical that networks are developed on the basis that all aspects of the discussions and measurements of data, are commercially driven. That is, market forces must be used to prioritise activities and establish how scarce resources are allocated to taking ideas forward.

One useful tool for growers is to map their supply demand chain steps for olives from the farm gate to the consumer. This process identifies where costs are added, but perhaps no value. It also focuses on how much control growers have on marketing their products. In a sense, this step must distinguish between selling and marketing.

Finally, ensure that every meeting has an agenda, which focuses on real issues, and that a chairperson controls the discussions. Please take notes, which identify issues, allocate responsibility as well as time frames.

2.5 Understanding Supermarket and Retail Purchasing Practices

There are many downsides when growers are forced through increased production, to look at markets, which are unfamiliar and usually available only to large organisations.

This challenge has threatened horticultural growers for many years. Only those who rise above this challenge remain viable and gain the financial rewards that come from synergy and critical mass.

"It's been difficult for growers to accept the loss of a brand name that their fathers and grandfathers have been marketing for years……. But, the small growers are being pushed out as supermarkets and retailers look to deal with more expansive suppliers." Horticultural Marketing Company Chairman.

Thus, olive growers should realise that the industry they have entered in an international and globalised business and that they cannot watch as the world readies to oversupply the Australian market with cheap olive oils.

2.6 "Get the Team In Tent"

The recommended path from this point includes further discussion with the Growers about advantages and disadvantages from co-operative action to benefit from direct links with emerging large customers. In Asia, for example a solution strategy could be gleaned from studying how this process is managed by other horticultural industries and even widened to include New Zealand or USA.

Growers need to be kept informed about the changing market conditions and opportunities to review longer term potential.

There are always many reasons why meetings cannot be attended due to heavy work-loads, but failure to perform as a team means failure to perform overall.

The issue for olive growers in any region in Australia, is really, what is the first step in bringing together independent growers who may feel perfectly comfortable with their present lifestyle and possible returns, but who have no real idea of the challenge which faces all the industry.

2.7 Establish Collective Alliance Format and Operation

The objectives for an alliance or closer co-operation could include some of the following items:

If convinced that collective action is indicated then the Growers need to design and implement an alliance format that would present an expanded supply base of reliable products, resulting in improved returns for members;

Following an initial period of experience, a performance review would provide valuable feedback for inclusion in a case study or the benchmarking process discussed earlier; and

The desired outcome for this project is the establishment of a practical alliance format that can enhance the processing of olives, provide data and models which demonstrate feasibility and perhaps build similar case studies for presentation to other regions who wish to join the Newco marketing venture.

The process of developing trust takes time. Selling into a network will at times result in lower prices than can be obtained elsewhere. This has always been an issue which has threatened horticultural co-operatives. The networks described in this section are not co-operatives; they demand the highest possible discipline for delivering and selling 100 per cent of the crop. To start a venture without this protocol is a step to failure.

In terms of benefits from establishing networks for olive processing, it is probable that the biggest benefit is just working as a team, rather than competing in a rapidly supply driven sector. The next biggest benefit is seen through the financial models where seamless and transparent processes ensure that growers are not the ones to take a reducing margin and that all share the gains and the pain.

2.8 Summary

The two case studies used to develop this feasibility have been cross-referenced against the actual achievements by Gwydir at Inverell.

Gwydir and Newco have agreed that the models will be upgraded regularly and shared across each state and member group. It is expected that Newco's long term sustainability will be underpinned by this team approach.

Whilst there is only one other Alfa Laval plant operating to process olive oil in Australia, the potential to compare regional yields is not yet possible. It is therefore imperative that the next steps include actual benchmarking of like plants. Only by matching outcomes over one or more seasons, can the Australian costs and margins be effectively managed.

The study team encourage this step of sharing data and benchmarking for the industry. The formation of a highly effective industry association covering all aspects of the industry from growing, harvesting, processing, storage, packaging, selling, importing and exporting is now opportune and imperative.

3. Overview of Growing and Processing of Olives in Australia

3.1 The Rationale for Processing Olives in Regional Centres

As olive plantings around Australia increase, processing plants located as close as economically possible to groves are required. But no longer can many small olive producers expect to participate in the growing Australian market with small scale processing operation that caters for a small niche in a growing market. Competing with your neighbours does not appeal as the way forward in a truly international industry. Australia will be overwhelmed by international exporters unless a consolidated local industry approaches production and processing of premium quality oils in a coordinated manner.

To achieve this coordination, a network of "alliance partners" are in the process of establishing a marketing approach with product designed to meet customers needs for premium olive oils. To support this network, producers and processors will pull together to deliver consistent quality high value oils.

In broad terms the Australian market for olive oil is currently 25,000 tonnes per annum. The majority of this, 24,000 tonnes is imported with the quality standards of imports being more of the low cost refined olive oil than higher value, virgin cold pressed oils. Australia's average consumption is around 1.2 litres per head and every indication from market research in other projects indicates continued rise in this figure. Appendix 3, demonstrates the current consumption and potential market, given rises in consumption of from 2.5% per annum to 10% per annum over the next 10 years.

With a network of suppliers supporting a consolidated approach to marketing comes the need to determine the factors influencing and feasibility for the establishment of regional olive oil processing plants.

The dream of many growers has been to operate a vertically integrated program; grow the olives, process, bottle and sell.

This has not encouraged the formation of larger networks to achieve economies of scale, nor is it practical in terms of maximising returns either for the individual of for industry based enterprises. There is virtually no more room in specialty retail and delicatessen stores to stock more brands of gourmet olive oil.

Larger scale processing operations based close to fruit production centres will permit economies of scale and cater for a larger domestic industry in the years ahead. Large scale "centralised" processing has not eventuated, as up until now supply networks have not been present to support such activity. But as Australia moves towards more structured marketing of domestically produced oil, approaches to regional processing gather momentum.

The size and location of olive processing plants will be influenced by overall market prospects and capacity to produce olives of quality necessary and in volumes required to meet those market prospects.

Key Issues that olive producers need to consider in establishing viable olive processing businesses and which are addresses in this report, include:

- site selection and analysis;
- macro/micro climate, soil types, water availability and water disposal, nutrient loads, proximity to resources, cost
- selection of varieties;
- availability of suitable nursery stock, international history and reputation, local history, yield potential in this locality (kgs /tree and oil content), harvest interval and timing, likely biennial variation

- production skills and management capability;
- planning and operating to achieve maximum production, adequate labour with commensurate skills utilising the best agronomic support advice available
- management of supply of fruit;
- a process rather than ad-hoc receival of what is available
- capability to produce what is required , on time and consistently.
- quality management systems;
- quality assurance production systems in place including HACCP and a continuous improvement process.
- crop support programs; and
- availability of staff, expert advice, training, contracted equipment, service and resources.

If networks are formed to process oil, then it is imperative to convince the producers of the strength of the market for the quality and volume of oil likely to be produced. This includes describing the risks they will face.

Assuming the production sequence and the risks involved are understood, the producer must be given the best opportunity to have their fruit processed efficiently.

Having considered the above, processors will have a clear understanding of how and where the crop will be disposed of, what market opportunities exist now and 10 years hence.

Processing equipment must be sized correctly for the oil volume, and the quality standard required, these are two key issues in assessing plant needs.

3.1.1 Anticipated Fruit Volume

The Australian industry is small in terms of olive production but interest is increasing and plantings are rapidly expanding. Production volumes are quoted in kilograms per tree or tonnes per hectare. Tree planting density varies, thus tonnes per hectare is the more appropriate measure. Yields in a wide range from 7 to 20 tonnes per hectare may be expected. Olives have the potential to bear biennially, with variations of 50 per cent from one year to another, not uncommon. Orchard management practices are focussing on this characteristic and are expected to reduce the variation.

One of the concerns with large-scale commercial olive growing in Australia is that little history of varying management practice is available. Best practice from international experience may not replicate the same result under Australian conditions and any “trial” will take six years to demonstrate real benefits/loss.

Estimates of yield and quality on recently planted olive groves will be just estimates, but with sound logic supporting those estimates.

There has been no proven track that will guarantee an improved yield. However, it is important to note that oil varieties are better than dual-purpose trees for percentage of oil.

Poor weather, ripeness of fruit and late irrigation will all influence the rate of extraction of oil.

Fruit will be harvested between February and July and problems due to heat should be minimised. Ripeness and harvesting methods are new to Australia and although not covered by this study, must be included in any process designed to maximise grower and marketer returns. Across Australia the harvest season will vary due to seasonality and climatic conditions.

3.2 Current State

Olives have been grown in Australia for very many years both for fruit and oil. In the last 10 years there has been increasing interest in more substantial development of a domestic oil producing industry. Climatically Australia has many regions with similar climatic conditions similar to the traditional regions of the Mediterranean, source of the majority of olive products. The basic climatic requirements are cool wet winters and warm dry summer and most olives are grown in the northern hemisphere between 30 and 45 degrees of latitude. Frosts below 5 degrees cause tree damage and fruit set may be influenced by high temperatures and wind during flowering. Olives do not tolerate extremes of temperature and water/irrigation needs must be carefully supervised.

Agronomics of production has been well described by Departments of Agriculture/Primary Industry/Natural Resources providing producers with a very good view of soil, moisture and nutrient requirements and some view of other important cultural practices such as harvest techniques and orchard design. The characteristics of individual varietals under the conditions recommended for optimum production have not been assessed thus with a 4 year pause between planting out and first reasonable harvest, individual producers anxiously await results.

Experience from broadly similar areas in the Mediterranean may not translate directly to Australian conditions. Still, recent plantings have followed good practice from other locations.

There are many areas that meet the basic climatic requirements for olive production in Australia but large scale commercial production relies on more than just being in the right area. Farm management based on the best available agronomic advice is essential.

3.2.1 Trees and Location

Australian Olive Association at it's conference in 1998 (From NSW AG paper) estimated that there were 3.5 –4.0 million trees planted in Australia. Not all could be considered commercially viable and more recent work suggests 2 million trees as commercial plantings.

Fruit production is not recorded in Australian statistics and until now there has been only anecdotal information on fruit and oil yield by variety. It is known that there are more than 100 varieties planted in Australia and until now most have been selected on their Mediterranean reputation as good quality fruit or dual fruit and oil varieties. A National Olive Varietal Assessment project NOVA, has now commenced to obtain data leading to "characterisation of variety performance on a national level".

3.2.2 Prominent area where olives are grown include

Riverina NSW
Hunter Valley NSW
Mudgee, NSW
Wauchope/Hastings Valley NSW
Gwydir Valley NSW
Southern Highlands NSW
Central West NSW
Yass/Cowra
Boundary Bend Vic
Taggerty Vic
Robinvale Vic
Boort Vic
Yarrawonga Vic

Goolwa SA
Adelaide Hills
Naracoorte, Bordertown, KeithSA
Riverland SA

Inglewood, Texas, Yelarbon QLD

North of Perth
South of Perth

Production of olives in Australia for processing has not been a significant industry. In 12 months to December 1999, less than 1000 tonnes of commercially produced oil was processed in Australia for a market of approximately 25,000 tonnes of oil.

There are some highly successful small operations in the Australian industry who rely on local supply of olives of known quality with the oil being for well defined niche markets particularly in the food service sector.

Oil produced by these operators is of high quality standard and they are highly skilled, having developed a great reputation for their quality and culture.

Just as the wine industry has its leaders and innovators, so too does the olive industry. The issue for the future is harnessing the culture, emotion and innovation as achieved by the wine industry and driving competitive advantage.

There are also small producers supplying their local markets from "cellar door" sales. These brands are synonymous with the 'legends' of the industry.

Across Australian rural communities, small orchards of olives and olive wind breaks are common. These small groves may provide fruit and oil to their owners but are not considered in this project. Feral olives exist in the bush and could constitute a problem for commercial production. Again, some feral olives are included in the NOVA project to check their characteristics.

3.2.3 Fruit Supply

Supply for the current small processing industry has been from locally produced fruit with many different varieties represented. Fruit supply is purely local and quality varies with many different varietals represented.

The oil yield spread sheets included in this report cover the study team's projections of fruit and oil production from 50,000, 100,000, 150,000 and 1 million trees, with fruit yields varying from 12 to 15 and up to 20 per cent. These are included as Appendix 4.

3.2.4 Processing

Olives Australia Information Services lists 43 processing plants in Australia. Included among these plants are small batch plants with low capacity but the potential to turn out oil of good quality.

This project has focussed on continuous automatic plants of which there are 10 in Australia at present, nine with capacity of 1 tonne per hour or more and 1 with one half tonne capacity.

Locations of these plants are:

WA	2	SA	5
Vic	1	NSW	1
Qld	1		

3.3 Future State

The future state of fruit production and oil processing is likely to see establishment of networks to coordinate marketing and boost the proportion of Australian oil consumed and available for export as well as programs to attract new Australian consumers. Fruit production will show the benefit of larger production units with commensurate economy of scales and begin to show the benefits from applied research relating to varieties and agronomic practices specific to particular regions. There will be flow on effect for processors who will benefit from larger volumes of known quality and appreciation of consumers needs regarding quality standards of oil.

3.3.1 Trees and Location

The process of obtaining information on olive producers intentions to plant did not provide firm or reliable figures. The reluctance to share information as mentioned elsewhere in this report, results in sketchy estimates from some areas while cooperation from others provides a clear picture of general intent. The reliability of the data to hand is such that no figures are provided. The areas detailed previously are areas of focus and intending investors are urged to complete local analysis of potential suppliers within the general feeder area.

3.3.2 Fruit Supply

Fruit supply will increase substantially over the next 5 years as trees now one year old or planned for planting in the next two years come into bearing.

Anticipated yield increases are assumed as follows:

Years from planting	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Yield in Kgs/Tree	0	0	1	5	10	15	20	30	30	40	50	30	50	30	50

The variation from 30 to 50 kilos per tree for mature trees accommodates the biennial bearing factor.

Supply should benefit from producers management plans focussing on best practice methods and cost minimisation. Within five years there will be vastly enhanced knowledge of the performance of varietals from each region across the nation, with quality programs supporting production. Of significance in these QA programs will be the early analysis of fruit to determine the profile to be expected when full production occurs. The profiles will indicate the fatty acid profile which profile can be used to advantage by processors and blenders in matching oil to customer/consumer needs. SQF 2000 is a useful and proven quality management system for horticultural use.

3.3.3 Processing

Processors will have the benefit of market analysis and will proceed with investment in new installations with more confidence. Matching the processing style and plant capacity to expected market outcomes will be a key driver.

There are 10 continuous automatic olive oil processing plants in Australia now.

The combined capacity of these 10 plants is estimated to be a total of 10 - 15 tonnes per hour and under perfect conditions these plants could process 28,800 tonnes of fruit which could be produced by 1.9 million trees, assuming all production is for olive oil.

3.3.4 Consider the following Scenario

Scenario 1
Assume that the combined capacity of existing plants is 15 tonnes per hour :

- Plants operate at 75% efficiency
- Plants operate for two 8 hour shifts/day
- Processing continues for

a) 80 days or

b) 120 days

Then current Australian processing plants can process

15,360 tonnes of fruit in 80 days or

19,200 tonnes of fruit in 100 days

Scenario 2
Assume that the combined capacity is 15 tonnes per hour:

- Plants operate at 100 % efficiency
- Plants operates for 24hrs/day
- Processing continues for

a) 80 days or

b) 120 days

Then current Australian processing plants could process

28,800 tonnes of fruit in 80 days or

36,000 tonnes of fruit in 100 days

Each 1 million trees is expected to produce 15,000 tonnes of fruit. (15 Kgs per tree). Appendix 5 deals with the logic for yield variations.

For each new 1 million trees 15 new I tonne per hour plants will be required.

With planned tree numbers by 2003 at a total of 4 million more than now, 20 new plants could be required by 2003. Existing plants may be doubled in capacity and for the purposes of this example they are classed as new plants.

Continuous automatic plants range in rated capacity from 1/2 tonne per hour upwards.

The decision for the potential processor is to match capacity with current supply of fruit and to research the supply area and consider future expansion versus future supply.

Plants may be doubled or trebled in size after installation of the original processing line. Building size should consider future expansion when originally constructed

3.4 Establishing a Processing Plant

This section of the report deals with those issues which an Alliance Partner should consider when planning to build a processing unit. They are not all inclusive, but deal with issues which should ensure that the process is not delayed. In several cases which have been reported, growers have left their application for approval too late and this has resulted in both financial and timing hardships.

3.4.1 Gaining Approval

Using the case studies and the proven example of Inverell, the following is a broad outline of what could be expected in NSW in seeking approval to build an olive processing operation.

The initial approach should be made to the Alliance Partner's local Council. It will assist if the first approach is made with a basic business plan. This document enables the Council to see at first hand that the applicant is serious about developing an integrated step in their agricultural business.

In NSW and perhaps other states, the basis of seeking a 'Development Authority' is structured around a plant that can process 30,000 tonnes annually. Smaller quantities are treated on their merits and thus, most of the prospective plants will fall under that rating.

If above the 30,000 tonnes annually, then the application can be classified as a "Designated Development" which means it will require an Environmental Impact Study to be completed. This would include the applicant's selection of an environmental consultant to assist.

If the total costs were expected to be above $20 million and if the plant could create 30 jobs, the applicant would need to present the case to the NSW Department of Urban Affairs and Planning for their support. Depending on the timing, DUAP may have programs to support the applicant.

Other states should have similar approaches, but it is suggested that this shopping list should not be assumed and that the pathway is clearly defined so that support is gather on the way.

As a designated development, the applicant would need to obtain The EPA approval based on location not size. Once again, in NSW, this decision is made by the local Council.

In Victoria, potential processors are advised to present a case supported with a business plan and Business Victoria could consider appropriate incentives, based on the appropriateness of the application and the industry situation at the time.

In any event, from the approach to NSW Government to seek this information, the officers who were consulted have asked that when processing plants are planned in NSW that an overall approach is made to DSRD to ensure that Newco obtains the maximum levels of support for the overall project. In the case of other grower groups, a similar approach is recommended.

In making contact with several Councils across three states, the study team have been impressed by the willingness of Council Officers to interact with possible processing operations. Several Councils have specific programs which may be drawn upon to maximise speedy approval and minimise disruption. Some local and state inducements are available, however, these are purely based on the merit of the proposal and the diligence with which it is presented.

3.4.2 From the Case Studies:

Gwydir established a process template for achieving Council approval, which can be provided to Alliance Partners. In Gwydir's case a business plan was required, as is the current case in Victoria, which would include an enterprise the size of Boundary Bend Estates. Thus, when preparing for the first meeting with Council, have some of the answers to these topics listed.

Some objectives for consideration with an arranged meeting could include:

- bring Council members up to speed on the plans to establish a plant;
- Council officers see at first hand the proposal and they broadly advise the potential processor about their requirements for an approval process;
- include the respective Department of State and Regional Development in your planning, and present a business plan for the processing plant; and
- identify other opportunities for involvement of entrepreneurs in the olive industry.

3.4.3 Factory Processing

What hours are appropriate and legal in terms of noise, operations, waste, water needs, etc. Perhaps a new plant would not operate around the clock, but with the potential to secure contract processing and minimise costs, then 24 hour processing may be an option.

Extended processing will require several alternatives for inbound and outbound transport.

3.4.4 Building Costs

Plant building costs will depend entirely on the proposed throughput. Including a cellar for storage which minimises the need to pump oil must be considered.

Oil storage should include a minimum of six weeks maximum processing capacity and perhaps may have to hold a years full production. This would take into account holding some of last years oil. Blending and separation of varieties and qualities must be considered in sizing and number of tanks. They must have conical bottom and be capable of nitrogen sparging to minimise rancidity and spoilage.

3.4.5 Infrastructure

Water, electricity, waste, inputs, roadways, dust minimisation and HACCP requirements must be considered.

3.4.6 Staff, Skills and Training

Depending on the size of the plant, this can be matched to throughput. However, a minimum should be 2 per shift. Untrained staff could lead to product spoilage and loss of brand or market share.

3.4.7 EPA and other Government Agencies

From the above, it is clear that applicants should engage in personal representations with the equivalent of The State Environmental Planning Authority, Urban Affairs and Planning and any other which could facilitate the approval process. This could include Employment, Training and Education, where special skills are necessary and support programs are in place.

3.4.8 Location

The issue of location is important for Newco and also for other grower groups considering a plant. Whilst there are currently 14 plants, (as at September 2000) in Western Australia, the costs and location could have been minimised through working together to plan ideal locations, processing efficiencies and cost effectiveness. This is not a criticism of WA growers, only a simple statement of how the olive industry must gear up for the massive output of oil.

In some cases observed in this study, it appears that close co-operation could save at least two planned processing plants and thus around a $ million dollars towards the cost of selling and marketing the oil.

Location of a plant should consider options such as transporting olives for up to several hundred kilometers, perhaps for many years or just until there is enough oil to warrant a separate plant.

In one exercise for this study, around 46 truck loads of fruit were required to take the fruit to an adjacent processing plant. Does the grower buy or lease trucks, should they contract drivers, what are all the options to be considered and financially evaluated.

In the case mentioned, it was estimated that fruit grown within a 4 hour transport time could well be fruit that could be contract processed and therefore included in a specific feasibility.

3.4.9 Transport and Storage Options

The following items need to be considered when evaluating transport to an adjacent site for processing or storage awaiting processing at a local processing operation.

Undercover storage for inwards fruit is imperative, full sun and too much weight on the fruit can cause premature breakdown and therefore reduce quality of all the oil in that batch.

Typically fruit will be delivered in bulk bins with capacity of about 350-380 kgs stacked 3 high.

Bulk handling from grove to processing may be an area for innovation in handling. Planning the harvesting and transport to the plant is critical if management of different growers fruit and differing varieties is to be successful.

Truck loads must be planned so that the distances and road surfaces do not damage the fruit.

3.4.10 Storage for Finished Product

Stainless steel tanks are required for olive oil. The acidic content demands special types of stainless and therefore buying second hand tanks may be a mistake. The volume of storage required will depend on plant capacity, numbers of different varieties, grades of oil produced and market conditions. Some product may be shipped out early to a blending and packaging centre, but storage will still be required for a large proportion of the production. If the marketing aim of the venture is EVOO, it is likely that product will be stored for more than 12 months possibly up to 2 years.

Stainless steel fabrication is carried out in many towns around Australia. Whilst many other suppliers can meet specific requirements, prospective purchasers should obtain two quotes and transport of tanks may be offset by quality and price per litre. Tanks that cannot prevent oxygen contamination through sparging valves are required.

One company specialises in the wine industry and claim to be the major supplier to this industry. This supplier has stock sizes for the wine industry, and whilst they use 304 grade of steel and consider their tanks suitable for olive oil, it is recommended that a full specification be provided prior to ordering.

Costs of storage tanks vary from an indicative 17 cents per litre for 350,000 litres to 96 cents per litre for 5000 litre ex works and plus GST. Bulk storage of oil from 50,000 trees may require 110,000 litre capacity.

3.5 Processing Equipment Appraisal

3.5.1 Cost and Issues Involved in Establishing a Processing Plant

Determining the correct size and type of equipment is of course influenced by the fruit inputs and by the desired outcome in terms of oil to suit the identified market.

3.5.1.1 Considerations for Plant Sizing

Assume the plant is supplied by 50,000 trees yielding 15 kgs fruit each, yielding 15% oil with 90% extracted, then the output will be about 110,000 litres of oil.

3.5.1.2 Equipment Type

For this project only continuous, automatic oil extraction equipment has been considered.

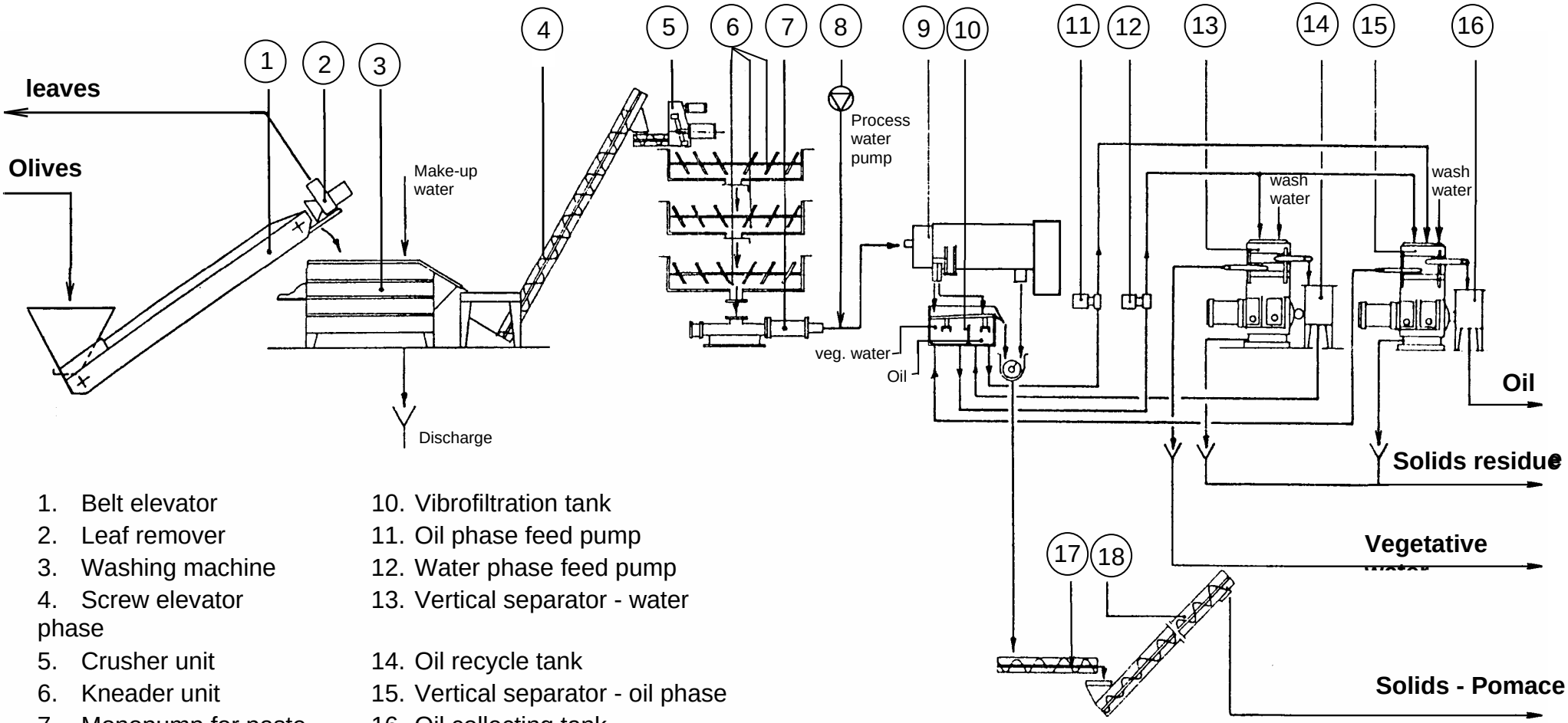
This process comprises:

- Fruit receival and weighing
- Leaf removal and washing

- Stone removal
- Washing
- Crushing
- Malaxing or Kneading
- A feed system for centrifugal extractors
- Centrifugal separation of liquids and solids
- Oil separation of liquids remaining
- Transfer to storage tanks with nitrogen suction
- Appropriate testing of finished product

The following figure describes the typical plant;

PIERALISI CONTINUOUS CYCLE OLIVE OIL EXTRACTION PLANT - FLOW DIAGRAM



1. Belt elevator
2. Leaf remover
3. Washing machine
4. Screw elevator
5. Crusher unit
6. Kneader unit
7. Monopump for paste
8. Process water
9. Horizontal centrifugal decanter
10. Vibrofiltration tank
11. Oil phase feed pump
12. Water phase feed pump
13. Vertical separator - water phase
14. Oil recycle tank
15. Vertical separator - oil phase
16. Oil collecting tank
17. Pomace screw conveyor
18. Pomace screw elevator

Note: This example shows 3-phase extraction. When operating in 2-phase extraction mode, the water phase vertical separator is not in the decanter. For 2 1/2 phase mode, the water separator is optional, depending on the total quantity of water to be discharged and water treatment options. Pieralisi plants can operate in either of these extraction regimes.

Essential systems requirements include buildings, potable water, electricity, water heater and fuel for heating, pumps, inwards goods and final product storage and also disposal systems for waste water and olive paste.

Continuous automatic processing equipment is rated in terms of potential tonnes of olives processed each hour.

3.5.1.3 Building Requirement

Equipment for processing 2 tonnes per hour is typically 16 metre long, 5 metre wide and 4 metre high. Space is unlikely to be a restriction in rural areas thus a building substantially larger than these dimensions will provide good working conditions and permit access for fork lifts to service heavy objects in the processing line. Most equipment is capable of taking modular editions to increase capacity. This is usually in extra width. A building of twice the width of the equipment originally purchased will allow for that expansion.

Building cost estimates: $250,000 to $350,000

Six metre high building is very adequate, so long as large bulk storage vessels are not included in the same building. In the section on storage, it is reported that if bulk storage vessels are under cover, building height should be no less than 7 meters. An additional 2 metres on tank height is required for access above the tanks.

Additional coverage for tank farm $50,000

3.5.1.4 Resources Required

Electric power and water are key elements. Depending on boiler style, LPG, Diesel or a husk fired boiler fuel will be required. If husk fired boiler is used, storage for dried husk from season to season is required.

Electricity consumption is estimated at 21 kWh for a 1 tonne per hour processing line and 47 kWh for a 3.5 tonne per hour capacity. This broadly equates to 155 kWh for 1 tonne oil from the former and 99 kWh for the latter.

In-put water must be of potable quality. Filtration and chlorination will be required if reticulated town or adequate rain water supply is not available. Approximately 300 litres of water per 1000 kgs of olives (1400 litres for 1 tonne of oil) processed is indicated.

Pondage for effluent water is required. Minimum water consumption is 300 l water per tonne of olives produced.

Effluent water is “harsh” with a typical pH of waste water is 4.5-5.8. Treatment of this water by addition of lime to make it less acidic will be required before disposal and BOD5 levels should be reduced by aeration. For each 1000 tonnes of olives processed 300,000 litres of waste water will be produced. Several ponds may be required if the water is used for irrigation purposes as treated, “irrigation water” should not be continuously mixed with new waste water.

Gas consumption for water heating is estimated by Pieralisi about 100Mjs per tonne of olives. External storage for gas supply is required.

To preserve quality, olive oil should be stored under a nitrogen "blanket" and should be pumped without aeration. Nitrogen storage and transfer to tops of tanks is required.

3.5.1.5 Bulk Storage

Storage of finished oil will require stainless steel tanks of sufficient capacity to hold at least one seasons production. Storage should be at even temperature and purging stored product under nitrogen is recommended. Upright tanks have smaller surface area for oil likely to be exposed and are recommended before horizontal tanks. A conical base for tanks allows any settling in storage to be monitored and oil to be drawn off above any sediment which may have occurred.

Storage capacity will depend on market activity, volume held by packaging plant oil quality and numbers of different grades. Appendix 7 describes some maximum storage needs for different scenes. Where pumping after processing is required, the use of pumps that exclude all air is recommended. Gravity feed is ideal. The plan is to avoid contact with air where ever possible.

As an example, if all of the oil from 50,000 trees yielding 15 kgs of fruit and 15% oil, is stored on one site, storage for one seasons crop, will be no less than 110,000 litres capacity and if a second season is to be stored, double that capacity is required. There may also be a need to have different standards of oil to be segregated.

3.5.1.6 Stainless Steel Storage Tanks

One company A & G Engineering at Griffith NSW, dominates the supply of stainless steel tanks to the wine industry where similar storage style is used to that appropriate for the olive oil industry. A & G express considerable interest in servicing the olive oil industry. This company offers tanks of virtually any size to suit customers needs. Indicative costs of typical products are as follows:

Volume Litres	Indicative costs $	Costs/litre $
4300	2,500	0.58
5000	4,800	0.96
10,000	6,000	0.60
20,000	8,500	0.425
50,000	11,000	0.22
100,000	22,000	0.22
350,000 Approx	60,000	0.17

The 4300 litre tank is lower cost as this tank is made from one sheet of steel. All tanks are manufactured in Griffith, NSW and transported to selected sites. Grade of steel used is Stainless Steel 304, claimed suitable for olive oil.

To all above indicative costs must be added GST and transport from Griffith to the plant site. Transporting 400 kms from Griffith for 20000 tanks would add an estimated $500 per tank for freight, assuming 3 were transported at the one time.

Pallet tanks with 1200 litre capacity for $3400 are also available. They are versatile and useful in a busy season, especially where blending and varietals are important. This product may be handled with normal fork lift, may be stacked three high when empty and two high when full. Total cost is much higher than static tankage but versatility is very great.

At present a nine month lead time exists for these products from A&G.

If storage is to be in 20,000 litre tanks and 220,000 capacity is required, cost of tanks 11 tanks excluding GST would be $93,500. Each 20,000 litre tank is 2.6 metres diameter by 5.0 metres high with a minimum 2 metres walkway on the top, making total height 7 metres. Eleven tanks would take up no less than 30 square metre floor space with a minimum of 7 metre height. (Space above must be sufficient to allow clear walkway for OH&S requirement) A 4300 litre tank for comparison is 1.5 metre diameter 2.0 metre high with 2 metre space above for walkway. These tanks should be covered, preferably indoors to avoid heating and cooling, thus the ideal is extra building to house this tank farm. No costs have been allowed for sparging.

3.5.1.7 Processing Equipment

The only processing style considered in this project is continuous and automatic and has the capability to operate over very long periods with very limited down time. The food industry generally relies on long processing times in continuous automatic equipment. Consider for example filters and centrifuges in the brewing operation, they operate virtually 24 hours a day and 7 days a week. Olive processing equipment is designed for continuous operation but this does not occur due to supply constraints and seasonality.

In olive processing 1000 hours of operation in a season may be all that is accomplished. In that 1000 hours, depending on supply conditions, there may be 5 or 6 different product inputs with variations due to variety and maturity. If the supply line is paid on quality of product output, measurement of oil content and quality standard will be required after each "batch." This is not a batch process but olives from different sources can be processed with one following the other. The Kneading/Malaxing process allows different products to processed at the same time. Between "batches" there will be a small volume of mixed product, likely between 2 and 5% of mixed product. The smallest proportion of mixed product eventuates when the Malaxing operation is working at full capacity continuously.

Continuous, operation is more efficient and lower cost than intermittent operation. Where there is a pause in operation it is necessary to clean by running water through the entire process. At the end of the season a "clinical" clean is indicated, taking the whole of the equipment which can be disassembled apart and thoroughly cleaning as per manufactures instructions.

Processing equipment is rated on tonnes per hour of processed fruit. Manufacturers say that their equipment can and does, under ideal conditions, exceed the rated capacity but that is very dependent on the quality of fruit inputs. Fruit maturity and variety are critical variants.

The processing operation is influenced by the type of oil to be produced. This project is based on high value virgin olive oil.

Harvest time for olives, depending on region and variety may extend over 120 days although 50 to 80 days is more likely. Timing is from March to June depending on location. Thus, full operational time for this plant, excluding storage, will be a maximum of 120 days. To this can be added start up preparation and plant cleaning and maintenance of another 30 days.

Plants suitable for continuous, automatic processing start at around 800 kgs per hour rated capacity and range up to 10 tonnes per hour. It is possible to modulate a line and double, treble capacity can be achieved quite readily. Processing rates are indicative only and vary with olive characteristics.

All major olive processing equipment manufacturers are represented in Australia

Alfa Laval Australia Pty Ltd is an Australian company marketing, supplying and servicing Alfa Laval manufactured equipment. Equipment is manufactured in Italy, imported on order from clients and installed with Alfa Laval's support team. Specialist Italian staff are brought in to support this operation and remain for commissioning of the site and training of operators. Delivery time is 16 to 20 weeks and price in calculated on the price in Italian Lire. Price variations are influenced by the cost of stainless steel at the point of manufacture and exchange rate for Italian Lire. (Stainless steel is the key raw material) In the 12 months to September 2000 the indicative price has risen about 8 per cent.

Service is provided directly by Alfa Laval and key spare parts are on site at Alfa Laval Huntingwood facility in western Sydney.

The Pieralisi Group (Gruppo Pieralisi) is represented in Australia by Michel Tilche & Associates Pty Ltd, Telopea NSW.

Pieralisi Group is based in Jesi, Italy. Michel Tilche & Associates supply equipment to all areas of Australia with many clients in olive processing and other food industries. They offer "full and comprehensive range of after sales service based on the extensive background in olive processing and design and construction of the machinery available from their principles. They provide a round the clock consultancy service using their direct contact with specialists in Italy. Spare parts, accessories and upgrade components are available through Michel Tilche Sydney Office."

Equipment supplied by Michel Tilche is manufactured in Italy by Pieralisi and sold and serviced by Michel Tilche and Associates. Servicing is via a contracted food engineering group, G-Force Engineering. Pieralisi recommend purchasers hold major spares on site. Experience is that few serious stoppages occur and most can be relieved with local engineering attention and use of the spares held by the processor. Again experience tells that maximum air freight time for any spares not available in Australia is one week from Italy.

Factory staff from Italy commission the plant and offer training to key staff of the purchaser. Pieralisi offer a "turn key" processing plant with exception of building, plumbing, electricity supply (up to the control panel) gas and water drainage.

The interconnecting hardware is included with the equipment.

Lead time is about 16 to 20 weeks and price variations are influenced by the relationship of Australian Dollar to Italian Lire and Euro.

Continuous olive oil plants have evolved over 70 or 80 years. Quantam leap changes in the current process and equipment are unlikely to occur and there appears to be little opportunity to introduce innovations. The major suppliers to this industry operate around the world and benefit from this widespread experience, thus the intending purchaser should be confident that new equipment purchased today will be as good as it gets. There is no new breakthrough about to occur in this process that has evolved over many, many years. Reputations are high and users report satisfactory experiences. The choice on which of the two reported on here is similar to the choice one would have between Holden and Falcon cars. Quality and performance right, service right, costs very similar, minor but well tried differences.

Indicative prices as at September 2000 (excluding GST) are as follows;

Theoretical Capacity	$000s
800-1000 kgs/hr	$280 - $298
1400-1600	$370
1800-2200	$3850 - $431
2400-2800	$467 - $501
4500-5000	$681

There are many options within this equipment that adds to or reduces the cost, such as double malaxers, four section malaxers, with purchasers choice of options depending on needs.

Upgrades with the addition of additional malaxing capacity is available. Typical cost of an upgrade from a 900 kgs/hr machine to 1800kgs/hr would be and extra $200,000, making the total cost then about $100,000 more than an original installation for 1.8 tonnes.

With the Australian oil processing industry in a developing stage, second hand equipment is rare. Some opportunities do exist though and contact with major suppliers will reveal if their existing

customers are considering an update and wish to dispose of their old machinery. As far as can be determined as at September 2000 only one machine of about 1 tonne per hour capacity is available second hand.

This equipment is very robust and is used for but a fraction of its potential capacity. Twenty year life is a reasonable life expectancy.

Ancillary equipment to support the primary processing plant includes;

- Pallets, fork lifts, bulk storage of finished product, and transport to further processing or packaging site;
- Inwards fruit weighing and outward oil metering equipment;
- Office space and office equipment considered necessary to support the enterprise;
- Bench top analysers for FFA, Peroxide values, Rancidity, Oil content, colour; and
- Product packaging is not covered in this report. This facility and any blending programs may be accomplished on this site or more likely contracted to a third party.

The equipment is capable of extracting other oils but given likely locations of plants and potential markets for other products such as avocado oil is not considered practical.

3.5.1.8 Staffing Requirement and Training

Current experience and equipment suppliers indicate that for up to 3 tonnes of fruit processing per hour one trained operator and one unskilled operator are required per shift. In addition to this a site manager is required to coordinate the operations. Tasks include quality management, scheduling inputs, reporting outcomes, overall plant management. This may not be full time and would depend on the extent of vertical integration on the site.

Equipment suppliers will initially train staff during the commissioning process. Further on the job training will be required. Where networks are formed within the industry opportunities will be available for operator skills to be benchmarked and benefits to be transferred form successful operators to those in a start up phase.

3.5.1.9 Quality Management, Quality Assurance and HACCP

Several aspects of quality standards, quality management and assurance and control of production must be considered in this feasibility project.

Quality Standard is the standard of oil to be produced. This must meet the specifications required by the intended customer. . Providing what the customer wants, when the customer needs it and at a price the customer expects to pay is the quality standard that should be produced. There are many different standards of olive oil, all are defined in The International Standard applying to olive oils and olive pomace oils adopted by the International Olive Oil Council. "Olive oil is the oil obtained solely from the fruit of the olive tree to the exclusion of oils obtained using solvents or re-esterification processes and any mixture with oils of any other kinds. In no case shall the designation "olive oil" be used to refer to olive-pomace oils.

Virgin olive oil is the oil obtained from the fruit of the olive tree solely by mechanical or other physical means under conditions, particularly thermal conditions, that do not lead to alterations in the oil and which has not undergone any treatment other than washing, decantation, centrifugation and filtration.

Virgin olive oils may in turn be sub-classified as follows:

Extra Virgin olive oil.: Virgin olive oil of absolutely perfect taste and odour having a maximum acidity, in terms of oleic acid, of 1% by weight.

Fine Virgin Olive Oil: Virgin olive oil of absolutely perfect taste and odour having a maximum acidity, in terms of oleic acid, of 1.5%.

Semi-fine: (or ordinary) virgin olive oil: Virgin olive oil of good taste and odour having a maximum acidity of 3%, with a margin of tolerance of 10% of indicated acidity.

Virgin olive oil not fit for consumption as it is, an off-taste and/or off-smelling virgin olive oil, or an oil with an acidity of more tan 3.3%. it is intended for refining or for technical purposes.

Refined Olive Oil is the olive oil obtained from virgin olive oils by refining methods which do not alter the initial glyceride structure.

Olive Oil (or pure olive oil) is the oil consisting of a blend of refined olive oil and virgin olive oil fit for consumption as it is.

Olive-pomace oil is the oil obtained by solvent extraction of olive pomace to recover residual oil. Can be produced as crude oil, refined, or blended with virgin olive oil. In no case can any olive-pomace blend be called "olive oil"

This project does not include any market information other than stating that Australia consumes about 25,000 tonnes of olive oil. The majority is imported and low quality standard is significant in import volumes. Before establishing an olive oil processing plant investors should carefully research the market to establish the "quality need" of their market; what does the customer want, what price will be paid and when is delivery required?

Quality Management and quality assurance direct the operating enterprise to manage the operation according to a plan and maintaining a program to document the system. A quality management system will have points to note corrective action and will maintain records of what has taken place. The management staff of the processing plant must demonstrate a commitment to the process of continuous quality management and have in place systems to measure performance and record performance.

The quality assurance system should include, right from inception, the principles of Hazard Analysis and Critical Control Points. HACCP is a process of assessing and monitoring food safety risk. There are seven steps in the HACCP system recommended by Codex Alimentarius Commission. In Australia, food safety is a key issue for Departments of Health, Local Government and the Australia New Zealand Food Authority. Within 2 years regulations will be in place that will require every "food" operation in Australia to have a food safety plan which should be based on the principles of HACCP. Intending investors in olive oil processing plants should develop HACCP based quality assurance programs for application from day 1.

Private consultants and Local Government environmental health officers can provide professional advice on the process of HACCP and food safety plans.

The processor should report back to the producer on the key features of the delivered fruit. Variety and volume of fruit, oil extracted, visual assessment of the oil and characteristics of the oil. All these features have influence on the product produced. The processor should take advantage of analysis by third parties of both fruit and oil. Establishments such as Charles Sturt University, Wagga Wagga will report on analysis of the fatty acid profile, oil content in 24 hours of receipt. Equipment for bench testing product for oil content and fatty acid profile is available but at considerable cost, upwards to $75,000. With analytical laboratories able to provide a 24 hour turnaround investment in laboratory equipment other than for titration is not warranted.

Free fatty acid and peroxide values of oil can be checked simply and at very low cost within the plant. The process is by simple titration, results are immediate, little training is require to complete the test and the equipment and reagents necessary are very low cost. About $200 would cover all costs. The benefits are that the processor will achieve rapid analysis of some of the key chemical measurement s of quality.

Knowing the profile of the fatty acids present is also an indication of one important feature of quality. Analysis of this characteristic is available from many commercial and research laboratories. Charles Sturt University at Wagga has considerable experience in this area. Producers should aim to have fruit analysed to report on fatty acid profiles. This can be done from the earliest crop before commercial volumes are available.

Quality standard checks on oil, include assessment of some chemical analysis for technical qualification and organoleptic testing. The latter, for reliability would be completed by a person approved by IOOC. As with wine, a practiced palate will give a good indication but will not pick up the minor nuances that differentiate finer variations.

3.5.1.10 Other Considerations

Water Quality in an out of olive processing plants are important considerations.

Water quality for use in the process should be of potable standard. (Potable water is suitable for drinking) Water clean up may be necessary before use. Filtration to clear of solids and chlorination to reduce microbiological contamination may be required.

The rate of use of water in a plant processing 1 tonne of olives per hour is approximately 200 to 300 litres per tonne of olives or approximately 1400 litres per tonne of oil produced

In addition to the volume used in the processing is water used in wash down and clean up. Care should be taken to use only acceptable biologically degradable compounds in wash down/cleanup water.

Potable water should be used where equipment contact is indicated, other wash down water, floors, walls etc need not be of such quality.

Waste water is acidic and difficult to dispose of. Typical quality of the waste water, called "black" or "vegetative" water has a composition of:

pH	4.5 to 5.8
Suspended solids	20,000 mg/l
BOD5	2000 mg/l
Chem Oxygen Demand	>50000mg/l
Fats, oils & grease	1.5-2% (1500-2000 mg/l)

Water with these characteristics is "harsh", with the high acidity being unacceptable in most places . But the waste can be neutralised with the addition on lime to bring the pH closer to 7.0 or to the level required for irrigation.

The BOD mass is very high and if left in an anaerobic state will give rise to unacceptable odours. Odour levels are specified in EPA regulations. Odour is reduced by circulation and air addition. Left to pond and not move, water with these characteristics will smell badly but the odour can be reduced with aeration even through simple circulation with a surface spray as an outlet.

In other large scale food processing plants where waste water with not too dissimilar characteristics is produced the waste is neutralised with lime to make the mix less acidic, ponding the water is monitored so that air is regularly introduced and the total mass regularly assayed.

The waste may be used as addition to irrigation water to irrigate high demand agricultural crops. NSW Environment Protection Authority has developed draft guidelines "The Utilisation of Treated Effluent by Irrigation" (Feb 1995) These guidelines have been developed to assist designers and operators to optimise the value of effluent in an agronomic system that is ecologically sustainable. NSW EPA encourages the utilisation of effluent where it is safe and practicable to do so and where it provides the best environmental outcome. (The draft guidelines have not been proclaimed as at September 2000.)

Soil and plant analysis will assist in identifying needs for irrigation with effluent before application. There are opportunities to convert this waste material into a useful resource and treatment may require relatively small investment at the plant to add value.. Professional agronomic advice will be required to identify crop prospects for use of this water. High biomass crops such as cereals and fodder crops including lucerne have a high demand and will most likely handle the high BOD content easily. Slower growing olives may take considerable time to consume the compounds present in the water, but mixed with standard irrigation water this may be overcome.

After neutralisation another disposal route may be as trade waste into local sewage systems. This method of disposal must receive approval of the local government authority who in turn will approve under the relevant regulations from the Environment Protection Authority.

What ever route is followed for disposal of waste or conversion of waste into a value added component of the process, it is recommended that local government and EPA are made fully aware of the process and how operators are planning to meet the defined outcomes of the acts covering pollutants. In NSW for example any proposal to utilise effluent for irrigation purposes requires EPA approval. Early discussion with EPA is encouraged. The Acts and regulations vary from state to state, they are mostly outcomes based and do not specify how an operator should achieve a result but rather what outcomes are required. Air, noise, water and solid waste pollutants should be considered in the planning and where appropriate included in the HACCP Quality assurance program.

Where networks are formed for processing or marketing, an industry approach to EPA and a standardised path for the industry to follow is recommended. Technical consultants can assist in assessing problems and designing solutions.

The quality of water discharged would be assessed by EPA on a site specific basis.

Processing systems differ in their rate of water usage and discharge water, the so called two phase processing system of processing discharges much less free water than three phase system.

Pomace

The volume of "solid" waste will 50 to 60% of the fruit input.

This waste bulk material, paste or pomace must also be disposed of appropriately. It does have a use as stock feed if it is dry and destoned or it can be used as a mulch.

Separated olive stone material can be utilised as a high value fuel source in either a loose form or pressed into briquettes. Pressing into briquettes requires additional equipment the cost of which makes this alternate not economical.

Pieralisi state that dry, destoned pomace has typical characteristics of:

Crude protein	8.3 to 15.4%
Crude fat	8.0 to 24.6%
Crude fibre	21.4 to 41.4%
Nitrogen free extract	24.2 to 47.8%
Ash	3.1 to 13.4%

Pieralisi state that no more than 12 to 20% of pomace should be used in any ration.

The simplest use is as mulch for olive trees where caking of the waste on the surface should be checked and avoided

Where close to markets, dry pomace may be offered as a horticultural composting material

If no other alternative is available, waste disposal in public waste disposal sites is an option and should be discussed with local government and EPA before proceeding.

3.6 Constraints and Drivers of Sustainability

3.6.1 There are Perceived Constraints on Production of Olives

In particular the following were identified during the study:

- Available land and water and water licenses
- Finance for development of the grove and then the processing operation
- Availability of nursery stock of the most suitable olive variety
- Lack of positive information on which variety produces the best outcome for oil production in specific locations

Best agronomic practices do not appear to have been confirmed for major potential production areas, for example, planting rate, pruning disciplines, harvest times and techniques, water and nutrient needs.

Potential for producers to innovate on the production process have not yet materialised to any great extent. For example, there are many opportunities for bulk handling and harvesting equipment to be presented to grower groups and Newco to ensure that Australia identifies competitive advantage and maintains its leadership. Surely these are the lessons that can be learnt from the wine industry.

Other horticultural pursuits have developed unique processes just for their industry. This characteristic of the Australian farming scene is yet to emerge from Australian olive producers.

Pest and disease management and approvals for registered chemicals are all issues requiring clear definition for the industry. (Manufacturers have too few recommendations on current labels for olives, thus, either R & D work required to support label changes or special permits to be issued).

Uncertainty in regard to market conditions for oil produced is a factor that should drive groups together to maximise effectiveness.

Weather conditions at harvest and during processing will become either drivers or constraints in terms of quality.

Biennial bearing potential needs to be addressed and managed into production scheduling.

Limited agronomic advice, specific to the olive industry was generally seen as a constraint.

Need for industry wide definition and acceptance of QA and HACCP in production. This alone has the capacity to include or exclude olive oil from the shelves of Australian and international supermarkets.

Transport to the processing site and ensuring that no physical or chemical breakdown takes place.

Skilled farm workforce for critical processes such as pruning and harvesting underpins the QA and HACCP process.

3.6.2 Constraints on Production of Olive Oil

Any unresolved constraints on production of olives will have an influence on processing and many of the constraints carried over from production cannot be relieved by actions from the processor.

If some European countries are forced to downgrade oil due to poor practices, then Australia must develop a code of practice which delivers the highest quality olives to the processing plant.

Some of the constraints which can impact production of oil include:

- Extent and quality of market knowledge and where to sell differing oils;
- Distance from production to processing must be governed by quality and economics;
- Fruit volume and variation in quality delivered from diverse suppliers needs to be managed by the processing operation;
- Fruit quality, fruit does not yield as expected, not mature, over mature, low oil content, fatty acid profiles less than desirable, fatty acid profiles not known;
- Equipment capacity must be capable of being upgraded and versatile to meet unplanned fruit receivals;
- Market conditions for final product need to be part of the planning process for blending, bottling and segment marketing;
- Recognition or development of regional variants of oils may be too early at this stage of the industry's development, but it adds value to Italian products and has driven the wine industry's success;
- Problems of waste disposal will not go away. Finding alternative uses for the waste as well as the water from the plant are becoming more and more of an issue;
- Cost of establishment and cash flow predictions need to be effective and not plucked out of the air;
- Determination of oil quality, testing for "grading" and access to qualified blenders is imperative to maximise positioning and margins;
- Establishment of quality standards and capability to meet oil quality standards;
- Cash returns and revenue expectations of fruit producers needs to be clearly defined and should form part of a contract;

- Availability of skilled staff in regional areas should not be taken for granted. Many local Government areas are anxious to gain more employment and they may have programs designed to train such staff;
- Equipment breakdown/servicing during production period should be carefully considered and options in place should this arise;
- Consistent quality standards are not in place and this will only be achieved when it is Australia wide and industry regulated;
- Adequate storage for 18-24 months is a must for any new plant; and
- Kneading/malaxing is the slowest part of the process line. Production may be constrained by this time if volumes are near capacity of the plant.

3.6.3 Drivers of Sustainablity of the Industry

An attractive return for the industry will encourage investment. Investors in processing plants must recognise that there is a substantial market for olive oil but that Australia's place as a producer and supplier is not yet established or guaranteed. With well directed marketing and significant investment in education, customers and consumers should be persuaded to seek out Australian oil of high quality standard.

Quality assurance systems and quality standards must be developed and must underpin the emerging olive industry. Both producers and processors should be involved and with the correct systems and standards in place throughout the industry.

Preliminary market analysis indicates that higher value virgin oil is the preferred product choice for high end market segments, however, supermarkets with investments by European suppliers are driving blends such as pure and light oils.

Oil quality is influenced by fruit quality and producers must take every opportunity to obtain the profile of their fruit from the earliest yields. Oil extraction from immature trees may not indicate percentage of oil from mature trees but fatty acid profiles, a critical measure of oil quality can be determined from early yields. Growers should profile their fruit at the earliest opportunity and convey results to their chosen processor.

4. Industry Modelling

This chapter sets out the development of a financial spreadsheet model for a hypothetical regional olive oil processing plant.

The detailed spreadsheet is presented in Appendix 7. All page references are to Appendix 7.

4.1 Rationale

The model is constructed to determine profitability and cash flow. The two key results of the model are the amount of equity capital required and the "return on investment" on that equity for a hypothetical regional processing plant.

The main factors which affect the financial viability of an olive oil processing plant are the cost of fruit and the price obtained for the oil. The model determines the effect on equity required and return on investment of variations in these variables. It can also be used to determine the effect of changes in other variables, e.g. yield of oil and the cost of key inputs such as labour and electricity.

The model covers a ten-year period during which the volume of fruit to be processed increases greatly, requiring continuing investment in processing plant and equipment.

The model has been developed on the basis of the following key assumptions.

A regional olive oil processing plant will process fruit from growers within a radius of some hundreds of kilometers of the plant. Some 20 such regional areas have been identified throughout Australia.

The processing plant will purchase fruit from growers at a price based on the oil content of the fruit, not on gross tonnage. The price will be for fruit delivered to the plant, i.e. freight from farm to processing plant will be at the grower's cost.

The processing plant will produce and store olive oil in bulk quantities, to be sold to a blending, packaging and marketing facility in a different location. The price obtained for the bulk oil is a factory-gate price.

This model is based on the quantity of oil expected to be processed in one particular region of Australia. The production profile will be different for every region.

It depends on the number of trees planted each year, their expected yield of fruit, and the yield of oil from fruit. Application of this model to different regions will require detailed analysis to determine the expected production schedule for each region, together with accurate costs for that region.

It is assumed that modern continuous olive oil processing equipment will be used, purchased in incremental modules and units to handle the expected volume of fruit. Processing data together with capital and operating costs has been provided by the manufacturers and agents of *Alfa Laval* and *Pieralisi* equipment from Italy. The assistance of their representatives is acknowledged with thanks.

It must be stressed that the model is only a first approximation of the financial viability of a processing plant, and the effects of changes in costs and prices. Any decision to build a regional processing plant must be based on much more detailed analysis, the development of a financial model with monthly rather than annual rests (to accurately estimate working capital), and preparation of a professional Business Plan to assess the amount of investment required and a sophisticated analysis of risks.

4.2 Assumptions

The basic assumptions in the model are set out on page 1 of the spreadsheet.

As stated above, the model begins with the expected tonnage of fruit to be processed over a ten-year period. The amount of oil produced depends on the yield. An average yield of 15.0% (weight:weight) is assumed. Considerable variation is expected in this figure between varieties and regions. The model can be used to estimate the effect of variations in expected yields on the finaancial viability of the processing operation.

The cost of delivered fruit is based on paying $6.00 per kilo for the oil extracted from the fruit. Variations in this key variable are analysed in the results.

The sale price of the oil is another key variable. It is initially set at $15.00 per kilo.

The second section on page 1 determines what processing capacity will be required over a ten-year period to meet the expected supply of fruit. The required capacity depends on the level of processing efficiency achieved, the length of the harvest season and the number of hours per day the plant operates. Data used in the model reflects the present understanding of how these factors will vary in the future.

The third section on page 1 sets out how the required plant capacity may be provided by acquisition and upgrading of standard size operating plants and modules. It is a somewhat arbitrary allocation of installed capacity. Most regional operators are starting out with basic plants of approximately 0.9 tonnes/hour capacity. In most cases they can be upgraded to 1.8 to 2.0 tonnes per hour by modular addition as required. Thereafter, it is assumed that additional plants of increasing size will be needed to process the rapidly increasing volume of fruit from a typical region. The total processing capacity in the model increases from 0.9 tonnes/hour in Year 1 to 1.8 in Year 4 and thereafter by annual increments to 19.6 tonnes/hour to handle an expected volume of 31,713 tonnes of fruit in Year 10.

The final sections on page 1 estimate the requirements for oil storage capacity and total facility area to accommodate the expanding processing operation. Storage capacity assumes that one year's production of oil must be stored. This is based on the underlying assumption that processed oil will be transferred to a central blending and packaging facility within one year. If that is not the case, additional storage would be required for the oil until it is ready to be bottled and sold.

4.3 Asset Schedule

Page 2 sets out the schedule of capital expenditure required to build the processing plant. It is based upon estimates of the cost of various asset classes including land, buildings, plant & equipment, office equipment and vehicles.

It must be noted that the figures used are only estimates of the cost of all the required assets. Accurate estimates or quotations should be obtained for specific regions.

The model collects the asset classes into an Asset Register and calculates the annual depreciation applicable to each asset class, based on the assumed rates in column 2. Again, investment decisions must be based on much more rigorous financial forecasts.

The model does not provide for any plant and equipment to process waste water or solid waste. These are significant potential problems, as outlined elsewhere in this report. The costs of handling the waste streams is discussed under Processing Costs.

4.4 Processing Data

Page 3 summarises the processing data for the proposed operation.

The consumption rates for power, gas and fresh water are based on data from plant maufacturers, modified as necessary to suit this particular model. All must be regarded as approximate only. They will depend on the particular plant chosen, the way the separate plants and modules are combined, and the utilities to be used.

There is a discrepancy between the amount of fresh water used and the amount of waste water produced. They are based on two different methods of calculation.

Labour requirements are as specified by manufacturers for modern continuous plants. It is assumed that casual labour will be employed, despite the high skill levels needed. In addition, provision is made from Year 4 for additional unskilled labour during the processing season and from Year 3 for permanent factory labour, initially on a part-time basis.

4.5 Processing and Administration Costs

The operating costs of the processing factory are set out on page 4, based on the previous assumptions. Unit costs are typical for a regional location. Once again, there is a critical need to determine these costs accurately for any particular location.

The model assumes that waste water and solid waste will be disposed of at a direct variable cost. However, such costs are very high because of the composition of the waste streams. Unit costs are based on estimates obtained for the dumping of solid waste in a municipal tip, and for receival of liquid waste in a metropolitan waste transfer station. In reality, it is unlikely that either of these options would be available for the large quantities expected when fruit volumes begin to increase. Clearly, steps must be taken to install capital equipment to treat these waste streams. Meanwhile, the economic cost is taken into account in the model by way of realistic disposal costs.

Administration costs are considered typical for a food processing operation located in a regional area. Quality accreditation and quality assurance costs are preliminary estimates of what it might cost to obtain and maintain HACCP accreditation.

4.6 Profitability and Cash Flow

Forecasts of Profit & Loss and Cash Flow are set out on pages 5 and 6 respectively.

The P&L is in a standard format with the exception that it does not estimate stock levels. The Cost of Goods Sold is therefore not in the usual format for a processing business. A comprehensive Business Plan would incorporate monthly stock levels.

The P&L projections suggest that regional processing plants are potentially profitable operations. The model suggests a gross margin level of 56% and a net profit after tax level of 38% at the end of the 10-year period of operation. These figures are based on a fruit cost of $6.00 per kilo (for extracted oil) and an oil price of $15.00 per kilo. The figures vary dramatically when these key variables are changed, as discussed below.

The Cash Flow projections contain some important assumptions. One is that the income from oil sales will be received a full 12 months after production. That has a dramatic effect on the operating cash flow, but is considered realistic for the production of extra virgin olive oil, as discussed elsewhere in this report.

The funding requirements of regional processing operations would be significantly reduced if oil were transferred to, and paid for, by a central blending and packaging business within a shorter time of production. These factors will become important elements in the integrated planning of national olive oil groups or consortia.

Operating, administration and interest costs are assumed to be paid promptly. Some benefit to the processing operation would accrue if payments, e.g. for fruit purchases, were delayed. That would reduce both the working capital and total funding requirement of a regional processing business.

4.7 Funding Assumptions

The non-operating cash flow incorporates assumptions regarding capital expenditure and the likely level of debt funding which the business may be able to attract for various assets. They are set out on page 7 of the model.

Page 7 shows that various levels of debt funding are anticipated for different asset classes. The proportions are based on general lending policies of Australian banks for industries and assets of this type, for properly-secured loans. The model assumes that banks may lend up to 60% of the value of land, 50% of buildings and 33% of the cost of plant and equipment for a typical olive oil processing operation. In addition, it is assumed that 100% of office equipment and vehicles can be financed, e.g. by leases.

In reality, considerable variations must be expected in the amount of secured debt that can be raised for operations of this type. The model assumes a stand-alone business for which no other security is available. Considerably higher debt levels might be raised if additional security, outside the business assets, can be provided by owners.

The model provides for payment of interest and principal on debt finance according to the schedules on page 7. These represent only a first approximation. More detailed repayment schedules should be included, with monthly rests, in a business plan.

4.8 Results of the Model

The primary result of the model is the expected net cash flow from operations, set out on page 6. It incorporates all of the assumptions discussed in this chapter. The resulting cash flow will change if any of the underlying assumptions is changed.

The cash flow results have been used to provide two measures of the financial viability of the business.

The amount of equity capital required by the business is the minimum negative cumulative cash flow from the model. It represents the maximum amount of equity capital to be provided to avoid a negative cash balance. In the model as presented, that figure is $5.554 million and occurs in Year 7.

The “return on investment” is calculated as the internal rate of return on the net cash flows of the operation over 11 years (which takes account of the 12 month period assumed for receipt of sales income). The internal rate of return is only **one measure** of “return on investment”. It is used here to provide a convenient measure of the effect of changes in key variables on the overall return of the business over an extended period. The IRR determined for the base case in the model is 49.4% per annum. That is, by any measure, a very acceptable return for a long-term, high risk business such as this.

4.9 Risk Analysis

The primary purpose of developing the model is to determine how the financial viability of a regional processing plant is affected by changes in key factors which are presently not known such as fruit yields, oil yields and operating costs.

The model presented here is suitable for that purpose, but will require adaptation for any particular region to include appropriate values for all operating parameters and costs.

The two most important variables which will affect the viability of regional processing plants are the cost of the fruit and the price of oil produced. The effect of changes in both factors is set out in the following tables.

Effect on Equity Capital Required ($ million)

			Price of Oil ($/kg)				
		5.6	$ 10.00	$ 12.50	$ 15.00	$ 17.50	$ 20.00
Cost	$	4.00	5.6	2.9	1.8	1.3	1.1
of Fruit	$	5.00	10.0	5.4	3.2	2.1	1.4
($/kg	$	6.00	19.1	9.6	5.6	3.4	2.3
oil	$	7.00	29.4	15.5	9.3	5.7	3.7
content)	$	8.00	39.7	25.8	13.8	9.0	5.9

Effect on "return on investment" (IRR % pa)

			Price of Oil ($/kg)				
		49%	$ 10.00	$ 12.50	$ 15.00	$ 17.50	$ 20.00
Cost	$	4.00	42%	56%	67%	76%	84%
of Fruit	$	5.00	31%	46%	58%	68%	76%
($/kg	$	6.00	22%	37%	49%	60%	69%
oil	$	7.00	13%	28%	41%	52%	61%
content)	$	8.00	5%	21%	34%	45%	54%

The tables show great variation in the investment required and the return on that investment due to differing levels of fruit cost and oil prices paid.

The "expected values", based on a fruit cost of $6.00 and an oil price of $15.00, are $5.6 million in equity capital and a return on investment of 49% pa. Lower equity investment and higher returns are expected at higher oil prices and lower fruit costs. At lower oil prices and/or higher fruit costs, the equity funding requirement increases dramatically, and appears prohibitive, despite seemingly attractive potential returns.

4.10 Conclusion

A spreadsheet model has been developed for the likely financial operation of a regional olive oil processing business. It suggests that regional processing plants are likely to require equity capital of more than $5 million over a seven-year period, together with appropriate loan funding. Returns on investment of the order of 50% pa may be achieved, depending on fruit cost, oil price and many other processing variables whose values are not yet known. Returns on investment appear to be commensurate with the high level of risks involved in this emerging industry.

5. Adoption, Commercialisation and Communication Factors

5.1 Adding Value to a Region through a Processing Plant

Establishment of a new industry to a region has lasting benefits. Included in the benefits are:

- bringing a new industry with new challenges, new skills and perhaps even bigger demands on employment and local sourcing;
- increased investment in local property, plant and equipment, servicing and use of infrastructure;
- improved land valuations in rural towns from increased capitalisation on land use, especially where some agricultural activities such as dairying are diminishing; and
- increased local prosperity due to all of the above factors brining more dollars being invested in the local community.

Olive processing will require a small, seasonal workforce in the plant, usually no less than two per shift to process up to two tonnes per hour and two shifts per day.

Growers will be seeking some additional labour at harvest time, to manage the driving of trucks to take fruit to the processing plant. It is important that the processing plant is involved with planning this activity as economies of scale can start here.

Equipment servicing in some cases may be completed by local contractors and this increases their skill base.

Building the processing plant will require local engineering and building contractors. Understanding the demands of an HACCP approved plant can only increase their effectiveness when they approach the building of other food processing plants.

Production of olives consumes less water and fewer pesticides than many alternative crops suitable to a region and thus are kinder to the environment. Processing olives results in high acid waste water and this requires special treatment.

Olive growing requires higher labour inputs than broad acre farming, thus more job opportunities. These include growing, staking and tying them up, pruning, spraying and harvesting. A differing skill set is required for processing.

Olives are a very long term horticultural commitment.

Olives and olive oil processing like the wine industry has some potential tourist attraction

Reductions in imports brings benefits to the majority of the community

Specialised olive culture and processing courses will be developed for tertiary institutes.

5.2 Potential for Maximising Throughput.

Reward producers on the basis of quality of oil, not volume of fruit.

Call for fruit fatty acid and other fruit characteristics as early as possible from producers.

Schedule producer deliveries to match appraisals of optimum harvest timing on each supplier’s grove, minimise impact of varying quality inputs and optimise run times on plant.

Report results back to producers.

Encourage suppliers to develop quality management programs for production.

Seek guarantees of true to type stock planted out (Takes 5 years to know if you have got the right tree, possible to DNA test the nursery stock against a library of profiles) Seek accreditation from nursery.

Ensure staff adequately trained.

Select equipment and support services to meet current and immediate future market needs.

Work in harmony and avoid competition with alliance partners.

Getting all aspects of quality right.

QA systems in production, including HACCP. Apply a continuous improvement program in production, record results ad nauseum.

Seek co-operation of EPA, Local Government and other agencies of influence.

Set quality standards for production at each site

Encourage exchange of key benchmark criteria with alliance partners.

Ensure quality production is not compromised by storage, blending and packaging.

Quality standards for oils to match consumers needs is the ultimate driver and marketing activity will lift awareness of the availability of Australian made EVOO.

Develop and work to a business plan, meet all objectives and plan again.

5.3 Processing Efficiency Comparisons and Benchmarking with Other Regions

Savings through Networking can be achieved where growers and processors are prepared to share a range of specific data. The earlier work in section 2 of this report provided the foundation for benchmarking many criteria related to growing, harvesting and processing. The financial models developed for Newco were specifically structured to adopt this concept.

If Newco has six, seven or even more processing plants as part of its shareholding members, then their ability to drive costs down and maximise returns, yields and quality will ensure the business sustainability.

Examples of managing the process more efficiently may include; the opportunity to arrange supply to match planned plant throughput. This may be by variety, location and maturity. If growers are able to provide a profile of their fruit prior to harvest, the processor has the opportunity to call up specific requirements. Long run processing of similar fruit varieties will result in more effective production.

Supply networks will have the ability to provide predictions that enable the processor to adjust processing programs to suit quality criteria and customer specifications through blending.

5.4 Implications of Customer Demand on Quality Criteria

Marketing networks have greater resources to research and develop markets. Thus they can pass the findings back to the processor to maximise results.

Market knowledge will then flow down to individual processors in the group. The preview of market expectations will provide an overview that will contribute to the confidence the processor and producer have of long term returns from this new venture.

Drawing on customer driven quality criteria and matching this against market knowledge will develop market power through co-ordinated approaches to specific markets. Allocation of marketing resources will flow more effectively due to the identification and clarification of opportunities.

5.5 Potential for Alternative Plant Uses

The process equipment options must match the processing demand. Any equipment selected will lie idle for many months of the year. Processing other than olives through this equipment is possible but any residue of other than olive is likely to contaminate the olive oil. The process should be olive oil only and hence investors must recognise that the plant will be idle for 8 months of the year at least.

Some components of the plant may be suitable for processing avocados, however, from the above comments, changing the settings, preventing contamination and location away from the growing regions does not support alternative uses.

Pomace can be used as stock feed if it is dry and destoned or it can be used as a mulch.

The separated olive stone material can be utilised as a high value fuel source in either a loose form or pressed into briquettes.

5.6 Rationale for Refining Oils

This study has not addressed the need to refine oils that do not meet EVOO specifications or market needs.

There is a general expectation that Australia will produce very high levels of EVOO rather than the spread seen internationally. In the early days of increasing production, it is too soon to form a judgment, however, Newco will need to be fully appraised of available refiners who can take downgraded oil and produce the market requirement for light and pure products.

At present in the Australian supermarket segment, it is the pure and light oil segments which are increasing in terms of per capita consumption, rather than EVOO.

How and why oils are refined is a marketing policy decision for Newco. The issue is raised to caution against the present expectation that every litre produced will match EVOO specifications.

Should the market focus indicate that refined oils are required, this may change the cost of processing equipment, through the inclusion of components to enable either storage or further processing.

In the case where refined oils become more appropriate the costs of processing will reduce, but the margin received will be driven by the multi-nationals who source from any country where oils are cheap or match specific market segments.

6. Adoption and Next Steps

6.1 Recommendations

A series of key success factors follows. It is recommended that growers wishing to establish a processing plant consider these carefully:

- Ensure that available supply of fruit delivers the right varieties, quantities and yields;
- Carry out tests to determine quality of fruit, maturity, oil content, fatty acid profile and yields prior to factory processing. Record each growers details;
- Schedule growers deliveries to match appraisals of optimum harvest timing on each supplier's grove, minimise impact of varying quality inputs. Call for fatty acid and oil profiles from each producer;
- Only commence production with an efficient, fully serviced processing, handling and storage equipment of sufficient capacity to process expected supply;
- Clearly define customers needs in terms of quality criteria and market demands in regard to oil standards and communicate these to grower suppliers;
- Report back to suppliers on their results and variations. Introduce a system similar to Gwydir's that rewards for quality and pay only on oil recovered;
- Ensure that uninterrupted supply of fruit is available to effectively feed the processing unit;
- Ensure that the varieties and quality are similar;
- Implement a series of management and process controls to deliver customer quality criteria;
- Consistently train new staff and operators and educate growers in the plant's operating regimes so that they do not cause unnecessary delays;
- Reward growers on the basis of quality of oil not volume of fruit supplied;
- Seek guarantees that varieties are true to label, possibly test DNA and seek nursery accreditation;
- Ensure that quality production is not compromised by storage, blending, aeration or packaging; and
- Implement processing efficiency comparisons and benchmark with other regions of the Newco operation.

In financial terms, groups of growers who are evaluating networks as part of their plans for processing should have a specific return on investment in mind, prior to commencing the plant. In addition to this study, Newco Alliance Partners have established a financial model which traces olives from the farm gate to the customers door. This model forms a centre piece of Newco's long term sustainability. The study team suggests that others take the trouble to invest in a similar model.

6.2 Communications

The RIRDC proposal identified that the findings of this study could be delivered in a forum to which industry participants are invited at their cost. The study team awaits feedback in this regard.

RIRDC have a well defined method of communicating their reports to the industry, and their achievement in technology transfer is well recorded. In this case perhaps the possibility of telegraphing Australia's plans to the wider international industry could be considered.

Appendices

7.1 Appendix 1 – Executive Summary and Methodology

RURAL INDUSTRIES RESEARCH AND DEVELOPMENT CORPORATION
R&D PROPOSAL 2001/2002 PART A. EXECUTIVE SUMMARY

This application concerns a project to determine the feasibility of establishing regional olive oil processing plants in selected areas of Australia. The outcome of the study will form a model for enterprises considering the establishment of olive product processing facilities.

A group of olive producers bought together by Gwydir Grove Olives are forming alliances to enable a larger group to consider how they may most effectively work in partnership to optimise returns from olive and olive oil production. Gwydir Grove Olives has an international Alfa Laval oil extraction plant in Inverell in Northern NSW. Other olive producers have established oil extraction plants for their local production in various localities in regional Australia.

This project will be driven by a strategic alliance of olive producers from around Australia who at this stage have no processing plant or technology. The formation of this alliance is well advanced, is led by Gwydir Grove Olives and funded with external support. Included in the external funding is support for development of a marketing plan to cover output from the alliance partners in a new venture.

This alliance of 20-25 olive producer groups, including Gwydir Grove, seeks to examine the feasibility of oil production close to olive growing areas and to use a common label and brand for marketing their combined production. Estimates put the total planting of olives in Australia at 1.5 million trees and an estimated 1.5 non-bearing or about to be planted. By 2006 more than 3 m trees will be bearing. Oil production from this tree volume could exceed 6,500 tonnes against an estimated 25,000 tonnes of consumption and in 1997 22,571 tonnes of imports.

The objective of the alliance is to develop a very clear understanding of the key drivers for the olive oil industry in Australia, and to develop a strategy to replace no less than 5% of imported Olive oil with local production from the combined group. The Gwydir Grove company has 40,000 tress that are bearing and 100,000 about to be planted or non-bearing. The alliance partners between them would have more than 600,000 trees and those alliance partners are ready to form a single marketing enterprise.

The alliance partners come from many different areas across Australia and their plans call for analysis of the opportunity to set up regional processing facilities, but they require a detailed insight into the feasibility of such facilities to ensure that the Australian industry is competitive and continues to reduce costs of production.

Processing olives close to production source has the technical advantage of limited fruit damage from long transport and the commercial/social advantage of bringing new industry to rural areas. There are many similarities with olive oil production and premium wine production; harvest in optimum conditions, treat gently and process promptly and with great care and according to precise conditions. A key consideration following a feasibility study will be the capability of the alliance partners to follow the premium wine path with olive oil. Harmonised production processes aimed at consistent quality that may require blending to achieve the specified standard is an expected outcome of following the pathway determined by the feasibility study.
The project will research the factors that may influence the establishment and ongoing activities that impact regional olive processing.

The proposed project is directed to Gwydir Grove and it's alliance partners, but clearly, with RIRDC support the report will benefit the entire Australian olive industry. It will provide the industry with the tools to measure opportunity in other locations and a platform for developing plans for others in the industry. Establishment of processing operations in regional areas will bring benefit to those communities. A report will be available to RIRDC for publication.

The analysis of the opportunity to set up viable olive processing plants is a vital component of a business plan for the alliance partners. Achieving profitable market share for product from efficient processing plant are dependent one on the other.

Proving the commercial value of domestic production will encourage investment in and development of greater olive production. Production of olives has land, environment and community advantages similar to other long-term perennial horticultural. Well cared for long term horticulture is more gentle on the environment than intense, broad acre cropping. Local/regional processing facilities will provide new local employment and bring new skills to the region covered by the facility.

The benefit of regional plants working together is that all aspects can be benchmarked and where appropriate excess costs removed.

Project Title
To determine the feasibility for network partners representing enterprises involved in olive production for establishment of regional olive oil processing plants in Australia.

1400 Outcomes and Deliverables

The outcome of this project will be a model for the establishment of regional plants for processing olives.

The project outcome of the Feasibility study, will be a description of the costs and social benefits of establishment of regional processing plants for Australian olive processing. Olives are produced from many locations around Australia. There are clear advantages in correct site selection that takes advantage of local olive production, transport infrastructures, site availability, local government encouragement and availability of suitable work force. Selection will also be influenced by the variations in establishment and expected running costs. Gwydir has the experience of four years of processing and thus some knowledge of costs of establishment and operation.

A basic outcome will be a template for use by any enterprise considering establishment of regional processing facilities for olives. An immediate outcome will be direct guidance to those wishing to join an alliance on the opportunity to set up processing plants in several locations to process production from their geographically diverse alliance partners. Provided they can demonstrate critical mass and commitment most groups would have access to join the market alliance venture over time.

Separately the alliance partners will develop a road map for Olive producers and processors for marketing their output domestically and in export markets. Gwydir Grove will receive a clear cut plan to enable them to meet their corporate objectives of achieving no less than 5% of the domestic olive oil market in Australia by 2006. The marketing and business plan must incorporate the analysis of the potential for processing olives in many locations.

(ii) ***Background, relevance and potential benefits***

Australian agriculturalists will benefit from the replacement of imported olive oil with locally produced oil.

Australian communities will benefit from the establishment of new regional processing facilities.

Australian consumers will benefit from a wider choice of olive oil of domestic origin. Australians given a wider choice may consume more Olive oil than currently. There are well defined health benefits in consuming olive oil rather than oils with high saturated fat content. The overall health benefit will not be covered in this project but it should be noted.

An estimated $87 million of Olive oil is currently imported into Australia. Local oil production is very small, at less than 1000 tonnes. The last import figures for olive oil indicate imports of 22571 tonnes in 1997.

Consumption of olives and olive oils in Australia is slowly increasing

By 2006 Australia will have the capacity to produce up to 6750 tonnes of oil from 3 million producing trees. These plantations will be spread across Australia and oil production is likely to come from strategically located oil processing plants.

Producing oil from Australian produced olives is relevant as there are opportunities to reduce, or stem the increase in imports, to develop distinctly Australian product, and develop new industries and skills in regional areas. Product development and range extensions offer many additional avenues to enhance quality olive oil.

The largest, long term benefit is in increasing the share for Australian produced product and hence reducing the import bill from the current $87m which is mainly for Spanish and Italian imports. Further benefits from local oil production include the introduction of a new industry to a regional centre with attendant employment and training opportunities. The investment is not just in the plant and equipment for processing but also the infrastructure supporting this activity such as transport, storage, distribution, service support, engineering services and communications.

Olive production is on the increase in Australia and will increase even further when producers and investors recognise the opportunity for local oil and other olive products. Conversions of current Agricultural activity to olives will take place. Initial cash needs in olive production is high and already many investor schemes are emerging to attract new capital to agriculture

Olive production is perennial and is environmentally more "friendly" than many broad acre crops. It should be considered as environmentally neutral. There are no significant harmful effects from increasing olive production and olive oil processing. Health benefits following higher olive oil consumption has the potential to improve community health. Higher oil consumption can follow an increase in awareness of this new Australian industry and well placed promotional support.

(iii)***Research strategies and methodologies***

The researchers will assemble data on costs of establishment of oil processing plants of various capacities. The equipment manufacturers will be the base for this data collection.

The researchers will "map" existing and potential olive production in Australia and consider potential locations against expected olive production over the next 5 years. They will then assess each locality and consider;

- Equipment availability including used equipment;
- Olive supply dynamics and constraints;
- Transport and distribution, fresh and finished product;
- Unique costs/savings in this area;
- On going management and maintenance costs;
- Quality and safety conditions;
- Availability of labour and training opportunity;
- Services available;
- Local area encouragement/inducements;
- Competing forces; and
- Plant usage opportunities, full processing, part processing, alternate off season usage

The focus will be on localities that can serve the needs of the alliance partners who are currently joining a formal arrangement.

(iv) ***Communications/adoption/commercialisation strategy***

A final report will be delivered to a forum to which all alliance partners will be invited. Gwydir Grove shareholders and potential alliance partners will be involved at all stages of the project. Commercialisation of the project will form part of the separately developed and funded business plan

The principle shareholders in Gwydir Grove will be participating in the project and have committed in kind contribution. These shareholders have a vital interest in the outcomes. From the start this Gwydir Grove project has been cash funded by the shareholders. To date they have not sought external funding or venture capital investment, which could be driven by a taxation incentive before the desire to see real product outcomes are achieved. The current shareholders and future alliance partners of Gwydir Grove are thus vitally interested in a commercialisation strategy that will show them a return on their past investment. They will be involved at every step in this project.

The benefits for those outside this network will follow the promotion by RIRDC of the report that follows the completion of the project. The results will not be exclusively for Gwydir Grove and its alliance partners but their first hand knowledge and early advice on the outcomes will be delivered before publication of the report.

The alliance group would be regularly informed on progress throughout the project, indeed they will be asked directly for their contribution. The final report would be delivered in a forum to which all are invited to attend (at their cost)

(V) Timelines

The project will be completed with eight weeks of commissioning.

Reporting by the researchers to Gwydir Grove will be once per week. Following agreement that the researchers have completed the task, the researchers will be asked to deliver the results to Gwydir Shareholders and alliance partners. At this stage it is expected that this would be via presentation to a forum of alliance partners.

7.2 Appendix 2 – Questionnaire

Dear Gwydir alliance partner,

You will be aware from the various meetings with Gwydir Olives of Meyers Strategy Group involvement in a feasibility study on establishment of regional olive processing plants

Obviously key inputs to this study is fresh olive supply and current processing plant location, capacity etc. To this end we are seeking data from across Australia on olive tree numbers, location and varieties and some details of existing processing plants. Through contact with key players in the Australian industry and with support from Gwydir Olives we are assembling data and seek every opportunity to extend our search to verify the information.

Hence we come to you to seek your input.

The following Questionnaire covers many different aspects. You may have limited knowledge of some areas but any response would be appreciated. For example, you may not be involved in processing today but have considered it in the past. Tell us what you think about processing equipment and the virtues of different options. A view of the encouragement that may be given in your local area for establishment of a plant would be useful.

Of particular value would be the local supply prospect, what number of trees would/could be accepted as committed to "Newco" and what volume would you consider could be drawn in as contracted suppliers. (Newco is the name being used for the alliance partners marketing concept)

If possible your response should take into account others in your immediate area who are also potential "alliance partners in Newco. If you are able to submit a response that avoids double counting it would be appreciated.

Included in this transmission is a press release that describes the projects currently underway with Gwydir Olives.

Your email response to the above address or fax to 02 9958 0914 would be appreciated.

Thanks for your co-operation,

Yours sincerely

Peter Brodie.

Feasibility Study Questionnaire

For

Gwydir Olives Pty Ltd

For

Establishing a Processing Plant.

<u>Feasibility Study</u>.

Questions for stakeholders to assist in Information Gathering

A Olive supply dynamics and constraints;

1. Is there adequate potential supply of olives, within acceptable transport distance, to fill your capacity or the capacity you intend to install for olive processing?

   ……..

   ……..

2. If potential supply is less than the current capacity now, when would you expect supply to match your current capacity?

   ……...

   ……

   ……

3. What percentage of that capacity would be from olives supplied by "committed " Newco stakeholders? ……

4 To whom/how do current producers dispose of their crop?

   …….

   …….

5. In your olive growing system, do you use a quality management system such as SQF 2000?

   ……..

6. If other producers use quality systems in olive production, what proportion of the local crop is covered by this?

   ……

7. What is your estimate of total numbers of trees in your area?

   …….

8. The predominant variety is ……..

	Committed to Newco	Potentially contracted to Newco	Otherwise Committed
Bearing #Trees			
Non bearing			
Years to full bearing			

9 Estimated cost of olives at the farm gate is ……

10 What, if anything, would constrain further development of olive production in your area. (land, water, services etc)?

……..

B Equipment: capacity, availability including used equipment;

1. Do you have a processing plant for olive processing?

Oil and/or table fruit

a If not, are you considering installing any processing equipment? And what type would you install? ……..

b What style and make of equipment is used in each stage of the processing of olives in your processing plant?

……

2. Was it New or Used when installed? ……..

a What would be the replacement cost ……..

b Are you aware of other equipment that could be used for the same purpose?

……..

……..

……..

c What is the rated capacity of the processing line?

……

d What volume do you process/expect to process now?

3. What constrains the processing plant, where are the bottlenecks, (assuming olive supply is unlimited)?

……..

……..

……..

C Transport and distribution, fresh and finished product;

1. At the present time what is the longest distance olive growers would have to transport fruit to a processing plant? …….

2 Do you consider transport facilities serving your needs can handle olives and olive products satisfactorily?

……

D On-going management and maintenance costs;

1. Can you nominate cost per litre of oil, showing fixed costs and variable costs?

…….

2 What volume of olive processing represents a "break-even" figure through the (proposed) plant ? …….

E Quality and food safety conditions;

1. If you have any processing facilities at present, are these operations working under a quality management system?

……..

2. Are you familiar with quality management systems and food safety systems incorporating HACCP principals ?

……

3. Do you know if other nearby olive processing plants use such systems?

…….

F Availability of labour and training opportunity;

1. For the establishment and ongoing management of an olive processing plant in your area, is there available staffing resources to suit your needs?

…….

G Services available;

1. Availability of Training, equipment servicing and repair to meet your needs?

   …….

2. Will/would your local government accept waste from an olive processing plant?

   …….

3. If not, where would you dispose of waste material?

   …….

H State and Local government encouragement/inducements/restrictions;

1. In some local Govt and State activities there is financial encouragement for establishing new business activity?

2 Are you aware of such programs for your area? ……

3. What advantage have you taken of those programs?…….

4. Would you foresee any environmental constraints to further development of olive production and processing in your area?

   ……

I Competing forces;

1 What other processing plants for olives would compete for supply of olives in your general area?

   …….

   …….

2 Do you have any idea of their capacity and plant loading of "competing" plant?

   ……..

3 How/where would those olive growers not committed to Newco dispose of their crop in the future if they could not be contracted to Newco?

   ……..

   ……..

4 Other than committed Newco stakeholders, what proportion of the local crop would you expect could be signed up and be contracted to Newco?

   ……..

J Plant usage opportunities, full processing, part processing, alternate off season usage;

1 Have you considered alternate uses for an olive processing plant, if so what and could you incorporate that activity in your programs?

   ……..

   ……..

7.3 Appendix 3 – Potential Olive Oil Consumption

		Potential olive Oil Consumption					
	Population Million			Kgs per head	000s tnne		
		2.5% increase	000s tonnes	5% increase	000s tonnes	10% increase	000s tonnes
2000	19.04	1.26	23.9904	1.26	23.990	1.26	23.9904
2001	19.06	1.292	24.616	1.323	25.216	1.386	26.417
2002	19.1	1.324	25.284	1.389	26.530	1.52	29.120
2003	19.12	1.357	25.944	1.458	27.877	1.68	32.065
2004	19.15	1.391	26.634	1.531	29.319	1.84	35.327
2005	19.17	1.426	27.328	1.608	30.825	2.03	38.901
2006	19.19	1.461	28.041	1.688	32.393	2.23	42.835
2007	19.22	1.498	28.787	1.772	34.058	2.46	47.192
2008	19.24	1.535	29.537	1.861	35.806	2.70	51.966
2009	19.26	1.574	30.307	1.954	37.634	2.97	57.222
2010	19.28	1.613	31.097	2.052	39.563	3.27	63.009
In 2010 per cap cons=			1.61 Kgs		2.05 kgs		3.268 kgs

Assumes Pop growth at current rate of 1.012%

Assumes rate of consumption increases at 2.5%, 5% and 10%

7.4 Appendix 4 – Oil Yields

Assume 250 trees per ha, and 100% production for oil

Tree Numbers	Hectares	Yield per tree Kgs olives	yield per ha tonnes olives	Total tonnes Olives	Oil Vol/Ha @ 12% oil Tonnes	Total Oil Vol Tonnes	Oil Vol/Ha @ 15%oil	Total Oil Vol Tonnes	Oil Vol/Ha @ 20% oil	Total oil Vol Tonnes
50000	200	8	2	400	0.24	48	0.30	60	0.4	80
50000	200	8.8	2.2	440	0.26	52.8	0.33	66	0.44	88
50000	200	9.6	2.4	480	0.29	57.6	0.36	72	0.48	96
50000	200	10.4	2.6	520	0.31	62.4	0.39	78	0.52	104
50000	200	11.2	2.8	560	0.34	67.2	0.42	84	0.56	112
50000	200	12	3	600	0.36	72	0.45	90	0.6	120
50000	200	13.6	3.4	680	0.41	81.6	0.51	102	0.68	136
50000	200	16	4	800	0.48	96	0.60	120	0.8	160
50000	200	18	4.5	900	0.54	108	0.68	135	0.9	180
50000	200	20	5	1000	0.60	120	0.75	150	1.0	200
50000	200	25	6.25	1250	0.75	150	0.94	188	1.25	250
50000	200	30	7.5	1500	0.90	180	1.13	225	1.5	300
50000	200	35	8.75	1750	1.05	210	1.31	263	1.75	350
50000	200	40	10	2000	1.20	240	1.50	300	2.0	400

Tree Numbers	Hectares	Yield per tree Kgs olives	yield per ha tonnes olives	Total tonnes Olives	Oil Vol/Ha @ 12% oil Tonnes	Total Oil Vol Tonnes	Oil Vol/Ha @ 15%oil	Total Oil Vol Tonnes	Oil Vol/Ha @ 20% oil	Total oil Vol Tonnes
100000	400	8	2	800	0.24	96	0.30	120	0.4	160
100000	400	8.8	2.2	880	0.26	106	0.33	132	0.44	176
100000	400	9.6	2.4	960	0.29	115	0.36	144	0.48	192
100000	400	10.4	2.6	1040	0.31	125	0.39	156	0.52	208
100000	400	11.2	2.8	1120	0.34	134	0.42	168	0.56	224
100000	400	12	3	1200	0.36	144	0.45	180	0.6	240
100000	400	13.6	3.4	1360	0.41	163	0.51	204	0.68	272
100000	400	16	4	1600	0.48	192	0.60	240	0.8	320

100000	400	18	4.5	1800	0.54	216	0.68	270	0.9	360
100000	400	20	5	2000	0.60	240	0.75	300	1.0	400
100000	400	25	6.25	2500	0.75	300	0.94	375	1.25	500
100000	400	30	7.5	3000	0.90	360	1.13	450	1.5	600
100000	400	35	8.75	3500	1.05	420	1.31	525	1.75	700
100000	400	40	10	4000	1.20	480	1.50	600	2.0	800

Tree Numbers	Hectares	Yield per tree Kgs olives	yield per ha tonnes olives	Total tonnes Olives	Oil Vol/Ha @ 12% oil Tonnes	Total Oil Vol Tonnes	Oil Vol/Ha @ 15%oil	Total Oil Vol Tonnes	Oil Vol/Ha @ 20% oil	Total oil Vol Tonnes
150000	600	8.8	2.2	1320	0.26	158	0.33	198	0.44	264
150000	600	9.6	2.4	1440	0.29	173	0.36	216	0.48	288
150000	600	10.4	2.6	1560	0.31	187	0.39	234	0.52	312
150000	600	11.2	2.8	1680	0.34	202	0.42	252	0.56	336
150000	600	12	3	1800	0.36	216	0.45	270	0.6	360
150000	600	13.6	3.4	2040	0.41	245	0.51	306	0.68	408
150000	600	16	4	2400	0.48	288	0.60	360	0.8	480
150000	600	18	4.5	2700	0.54	324	0.68	405	0.9	540
150000	600	20	5	3000	0.60	360	0.75	450	1.0	600
150000	600	25	6.25	3750	0.75	450	0.94	563	1.25	750
150000	600	30	7.5	4500	0.90	540	1.13	675	1.5	900
150000	600	35	8.75	5250	1.05	630	1.31	788	1.75	1050
150000	600	40	10	6000	1.20	720	1.50	900	2.0	1200

Tree Numbers	Hectares	Yield per tree Kgs olives	yield per ha tonnes olives	Total tonnes Olives	Oil Vol/Ha @ 12% oil Tonnes	Total Oil Vol Tonnes	Oil Vol/Ha @ 15%oil	Total Oil Vol Tonnes	Oil Vol/Ha @ 20% oil	Total oil Vol Tonnes
1000000	4000	8	2	8000	0.24	960	0.30	1200	0.4	1600
1000000	4000	8.8	2.2	8800	0.26	1056	0.33	1320	0.44	1760
1000000	4000	9.6	2.4	9600	0.29	1152	0.36	1440	0.48	1920

1000000	4000	10.4	2.6	10400	0.31	1248	0.39	1560	0.52	2080
1000000	4000	11.2	2.8	11200	0.34	1344	0.42	1680	0.56	2240
1000000	4000	12	3	12000	0.36	1440	0.45	1800	0.6	2400
1000000	4000	13.6	3.4	13600	0.41	1632	0.51	2040	0.68	2720
1000000	4000	16	4	16000	0.48	1920	0.60	2400	0.8	3200
1000000	4000	18	4.5	18000	0.54	2160	0.68	2700	0.9	3600
1000000	4000	20	5	20000	0.60	2400	0.75	3000	1.0	4000
1000000	4000	25	6.25	25000	0.75	3000	0.94	3750	1.25	5000
1000000	4000	30	7.5	30000	0.90	3600	1.13	4500	1.5	6000
1000000	4000	35	8.75	35000	1.05	4200	1.31	5250	1.75	7000
1000000	4000	40	10	40000	1.20	4800	1.50	6000	2.0	8000

7.5 Appendix 5 – Rationale for Processing

Rational for processing

The following chart describes the potential volume of oil that could be produced from given tree numbers with assumed yield.

Assumptions backing this set of figures are
Yield per tree is constant year on year at the given yield rate, Rates given are 10 and 15 kgs per tree
Oil yield is from 13%, 15% and 20%

At 13% oil yield				
	Fruit	Total Fruit	Oil yield	Extracted
Trees	Kgs /tree	Tonnes	13%	Tonnes oil
50,000	10	500	65	58.5
200000	10	2000	260	234
1000000	10	10000	1300	1170
50,000	15	750	97.5	87.75
200000	15	3000	390	351
1000000	15	15000	1950	1755
At 15% oil yield				
	Fruit	Total Fruit	Oil yield	Extracted
Trees	Kgs /tree	Tonnes	15%	Tonnes oil
50,000	10	500	75	67.5
200000	10	2000	300	270
1000000	10	10000	1500	1350

50,000	15	750	112.5	101.25
200000	15	3000	450	405
1000000	15	15000	2250	2025
At 20% oil yield				
	Fruit	Total Fruit	Oil yield	Extracted
Trees	Kgs /tree	Tonnes	20%	Tonnes oil
50,000	10	500	100	90
200000	10	2000	400	360
1000000	10	10000	2000	1800
50,000	15	750	150	135
200000	15	3000	600	540
1000000	15	15000	3000	2700

Processing equipment is rated at the throughput of fruit per hour from say 1 tonne per hour to 5 tonnes per hour.

As noted elsewhere in this report the equipment is designed to operate and is well capable of operating at designed rated capacity for 24 hours a day continuously. But for reasons also explained elsewhere in olive processing will rarely achieve rated capacity for continuous operation.

From the figure below 50,000 trees yield 10 kgs per tree will take 21 days to process on equipment with capacity of 1 tonne per hour.

Assuming that the plant operates at 75% efficiency with down time for clean up and operational interruptions and only operates for two shifts instead of for 24 hours a day then the time to process the production from 50,000 trees yielding 10 kgs per tree extends to 39 days.

	10 kgs per tree or 2.5 tonnes per hectare			Actual Days
Trees	Hectares	Days	Process rate	to process
50000	200	21	at 1 tonne per hour	39
100000	400	42		78
150000	600	63		117
200000	800	83		156
Trees	Hectares	Days	Process rate	
			at 1.5 tonnes per hour	
50000	200	14		26
100000	400	28		52
150000	600	42		78
200000	800	56		104
Trees	Hectares	Days	Process rate	
			at 2 tonnes per hour	
50000	200	10		20
100000	400	21		39
150000	600	31		59
200000	800	42		78
Trees	Hectares	Days	Process rate	
			at 5 tonnes per hour	
50000	200	4		8
100000	400	8		16
150000	600	13		23
200000	800	17		31

	15kgs/tree or 3.75tnne/ha		

Trees	Hectares	Days	Process rate	
			at 1 tonne per hour	
50000	200	31		59
100000	400	63		117
150000	600	94		176
200000	800	125		234
			at 1.5 tonne/hour	
50000	200	21		39
100000	400	42		78
150000	600	63		117
200000	800	83		156
50000	200	16	at 2 tonnes per hour	29
100000	400	31		59
150000	600	47		88
200000	800	63		117
				0

	40kgs/tree or10tnne/ha			
Trees	Hectares	Days	Process rate	Actual days**
			at 1 tonne per hour	
50000	200	83		156
100000	400	167		313
150000	600	250		469
200000	800	333		625

			at 1.5 tonne/hour	
50000	200	56		104
100000	400	111		208
150000	600	167		313
200000	800	222		417
			at 2 tonnes per hour	
50000	200	42		78
100000	400	83		156
150000	600	125		234
200000	800	167		313
				0
			at 5 tonnes per hour	
50000	200	17		31
100000	400	33		63
150000	600	50		94
200000	800	67		125
	15kgs/tree or 3.75tnne/ha			

7.6 Appendix 6 - Storage Needs

Example of storage required for various production scenes

A) 15 % oil yield

		Tonnes	Tonnes oil	90% Extracted	Volume of oil Litres	Potential storage needs Grade 1	2	3	4
Trees	Kgs fruit/tree	Total Fruit	15% oil yield			50% vol	25% Vol	12.5% vol	12.5% vol
50,000	10	500	75	67.5	72581	36290	18145	9073	9073
100000	10	1000	150	135	145161	72581	36290	18145	18145
200000	10	2000	300	270	290323	145161	72581	36290	36290
50,000	15	750	112.5	101.25	108871	54435	27218	13609	13609
100000	15	1500	225	202.5	217742	108871	54435	27218	27218
200000	15	3000	450	405	435484	217742	108871	54435	54435
50,000	20	1000	150	135	145161	72581	36290	18145	18145
100000	20	2000	300	270	290323	145161	72581	36290	36290
200000	20	4000	600	540	580645	290323	145161	72581	72581

7.7 Appendix 7 – Financial Model of Feasibility

			Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
Assumptions												
Volumes and Prices												
Fruit Processed	tonnes		42	388	889	1707	3301	6233	10640	16607	23313	31713
Total Oil Produced	tonnes	15.0%	6	58	133	256	495	935	1596	2491	3497	4757
Fruit Cost - delivered	$/kg oil	$ 6.00	38	349	800	1537	2971	5610	9576	14946	20982	28542
Sales Value ($'000)	$/kg:	$ 15.00	95	873	2001	3842	7427	14025	23940	37365	52455	71355
Pocessing Assumptions												
Processing efficiency			50%	60%	75%	80%	85%	90%	90%	90%	90%	90%
Season length	days		50	60	70	80	80	80	80	80	80	80
Processing Time	hrs/day		8	12	18	24	24	24	24	24	24	24
Plant Capacity Needed	t/hr		**0.2**	**0.9**	**0.9**	**1.1**	**2.0**	**3.6**	**6.2**	**9.6**	**13.5**	**18.4**
Installed Processing Capacity (Tonnes per hour)												
Basic Plant			0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
First Upgrade						0.9	0.9	0.9	0.9	0.9	0.9	0.9
Second Plant								1.8	1.8	1.8	1.8	1.8
Third Plant									2.5	2.5	2.5	2.5
Fourth Plant										3.5	3.5	3.5
Fifth Plant											5.0	5.0
Sixth Plant												5.0
Total Installed Capacity			**0.9**	**0.9**	**0.9**	**1.8**	**1.8**	**3.6**	**6.1**	**9.6**	**14.6**	**19.6**
Oil Storage Capacity ('000 Litres)												
Total Storage Capacity		0.9319	7	62	143	275	531	1003	1713	2673	3753	5105

Required												
Additional Capacity each year			7	56	81	132	256	472	709	960	1080	1352
Facility Size (sq metres)												
Processing			150	150	150	150	150	150	300	300	450	450
Storage			30	30	30	40	80	160	240	360	480	720
Ancilliary			320	320	320	310	270	690	460	340	570	330
Total			**500**	**500**	**500**	**500**	**500**	**1000**	**1000**	**1000**	**1500**	**1500**
Asset Schedule ($'000)												
Capital Expenditure												
Land			30									
Buildings:												
Processing Plant			120					120		250		
Tank Farm			30				20	100	150	200	250	300
Office & Amenities			20			50		50		100		
Total Buildings			**170**	**0**	**0**	**50**	**20**	**270**	**150**	**550**	**250**	**300**
Plant & Equipment:												
Processing Plant			280			200		385	480	550	680	680
Storage Tanks			10	33	40	53	77	80	121	163	184	230
Waste Treatment												
Other Plant & Equipment												
Total Plant & Equipment			**290**	**33**	**40**	**253**	**77**	**465**	**601**	**713**	**864**	**910**
Office Equipment			5	5	10	10	10	20	20	20	30	30
Vehicles:												
Fork Lift				45			45		45		45	
Car			20			20			20			20
Truck					40			40			40	
Total Vehicles			**20**	**45**	**40**	**20**	**45**	**40**	**65**	**0**	**85**	**20**
Total Capital Expenditure			**515**	**83**	**90**	**333**	**152**	**795**	**836**	**1283**	**1229**	**1260**
Asset Register												
Land			30	30	30	30	30	30	30	30	30	30

Buildings			170	166	162	208	222	487	625	1159	1380	1646
Plant & Equipment			290	294	305	527	552	962	1466	2033	2693	3334
Office Equipment			5	8	16	20	24	36	44	49	63	72
Vehicles			20	61	89	91	118	134	172	138	195	176
Total Assets			**515**	**560**	**601**	**876**	**945**	**1649**	**2337**	**3409**	**4361**	**5257**
Depreciation												
Buildings		2.5%	0	4	4	4	5	6	12	16	29	35
Plant & Equipment		10.0%	0	29	29	31	53	55	96	147	203	269
Office Equipment		33.3%	0	2	3	5	7	8	12	15	16	21
Vehicles		20.0%	0	4	12	18	18	24	27	34	28	39
Total Depreciation			**0**	**39**	**49**	**58**	**83**	**92**	**147**	**211**	**276**	**364**
Processing Data												
Number of Operating Units			1	1	1	1	1	2	3	4	5	6
Operating Hours			400	720	1260	1920	1920	1920	1920	1920	1920	1920
Installed Power	KW		38	38	38	55	55	108	181	266	366	466
Power Consumption	MWhrs		15	27	48	106	106	207	348	511	703	895
Gas Consumption	Mj/hr		100	100	100	200	200	450	700	1050	1500	1950
Gas Consumption	Gj		40	72	126	384	384	864	1344	2016	2880	3744
Water Consumption	litres/hr		250	250	250	500	500	850	1350	1800	2350	2900
Water Consumption	000 litres		100	180	315	960	960	1632	2592	3456	4512	5568
Waste Water	000 litres	233	10	90	207	398	769	1452	2479	3869	5432	7389
Solid Waste	Tonnes	67%	28	260	596	1144	2211	4176	7129	11126	15620	21248
Maintenance Cost	$/hr		10	10	10	13	13	28	54	71	90	110
Labour - number												
Skilled Operators			1	1	1	1	1	2	3	4	5	6

Unskilled Operators			1	1	1	1	1	2	3	4	5	6
Unskilled Factory Staff						0.5	0.5	1	1	2	2	3
Permanent Factory Staff					0.5	0.5	1	1	2	2	3	3
Labour - hours												
Skilled Operators			400	720	1260	1920	1920	3840	5760	7680	9600	11520
Unskilled Operators			400	720	1260	1920	1920	3840	5760	7680	9600	11520
Unskilled Factory Staff			0	0	0	960	960	1920	1920	3840	3840	5760
Permanent Factory Staff			0	0	960	960	1920	1920	3840	3840	5760	5760
Processing Costs ($'000)												
Direct Labour ($'000)												
Skilled Operators		$ 20.00	8.0	14.4	25.2	38.4	38.4	76.8	115.2	153.6	192.0	230.4
Unskilled Operators		$ 15.00	6.0	10.8	18.9	28.8	28.8	57.6	86.4	115.2	144.0	172.8
Unskilled Factory Staff		$ 15.00	0.0	0.0	0.0	14.4	14.4	28.8	28.8	57.6	57.6	86.4
Permanent Factory Staff		$ 15.00	0.0	0.0	14.4	14.4	28.8	28.8	57.6	57.6	86.4	86.4
Labour on-costs		15%	2.1	3.8	8.8	14.4	16.6	28.8	43.2	57.6	72.0	86.4
Total Direct Labour			**16.1**	**29.0**	**67.3**	**110.4**	**127.0**	**220.8**	**331.2**	**441.6**	**552.0**	**662.4**
Operating Costs ($'000)		Unit Cost										
Power		$ 135.00	2.1	3.7	6.5	14.3	14.3	28.0	46.9	68.9	94.9	120.8
Gas Consumption		$ 18.00	0.7	1.3	2.3	6.9	6.9	15.6	24.2	36.3	51.8	67.4
Water		$ 0.80	0.1	0.1	0.3	0.8	0.8	1.3	2.1	2.8	3.6	4.5
Waste Water Treatment		$ 100.00	1.0	9.0	20.7	39.8	76.9	145.2	247.9	386.9	543.2	738.9

Solid Waste Disposal		$ 40.00	1.1	10.4	23.8	45.8	88.5	167.1	285.2	445.1	624.8	849.9
Quality Assurance				2.0	3.0	5.0	10.0	15.0	20.0	25.0	40.0	50.0
Maintenance			4.0	7.2	12.6	25.0	25.0	53.8	103.7	136.3	172.8	211.2
Total Operating Costs			**9.0**	**33.8**	**69.1**	**137.4**	**222.3**	**425.9**	**729.9**	**1101.3**	**1531.1**	**2042.7**
Administration Costs ($'000)												
Accounting and Audit Fees			5.0	5.0	10.0	10.0	15.0	15.0	20.0	20.0	20.0	20.0
Bank Charges		0.1%	0.1	0.9	2.0	3.8	7.4	14.0	23.9	37.4	52.5	71.4
Directors' Fees & Exp's			2.0	3.0	4.0	10.0	10.0	15.0	15.0	20.0	20.0	20.0
Insurance			4.0	5.0	6.0	8.0	10.0	20.0	40.0	60.0	80.0	100.0
Office costs			2.0	3.0	4.0	5.0	7.5	10.0	12.5	15.0	20.0	25.0
Phone, fax, internet			4.0	5.0	6.0	8.0	10.0	12.0	12.0	12.0	12.0	12.0
Quality Accreditation			5.0	5.0	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0
Rates			4.0	4.0	5.0	5.0	6.0	6.0	8.0	10.0	15.0	20.0
Salaries:												
Plant Manager			10.0	10.0	50.0	50.0	50.0	80.0	80.0	80.0	80.0	80.0
Office Staff					20.0	20.0	40.0	40.0	40.0	60.0	60.0	60.0
Salary on-costs		15%	1.5	1.5	10.5	10.5	13.5	18.0	18.0	21.0	21.0	21.0
Total Admin Overheads			**37.6**	**42.4**	**127.5**	**140.3**	**174.4**	**235.0**	**274.4**	**340.4**	**385.5**	**434.4**
Profit & Loss ($'000)												
Income												
Sales of Oil			95	873	2001	3842	7427	14025	23940	37365	52455	71355
Other												
Total Income			**95**	**873**	**2001**	**3842**	**7427**	**14025**	**23940**	**37365**	**52455**	**71355**
Operating Costs												
Cost of Fruit			38	349	800	1537	2971	5610	9576	14946	20982	28542
Direct Labour			16	29	67	110	127	221	331	442	552	662
Operating Costs			9	34	69	137	222	426	730	1101	1531	2043
Depreciation			0	39	49	58	83	92	147	211	276	364

Total Operating Costs			**63**	**451**	**985**	**1842**	**3403**	**6349**	**10784**	**16700**	**23341**	**31611**
Gross Margin			32	422	1016	2000	4024	7676	13156	20665	29114	39744
% of Sales			33%	48%	51%	52%	54%	55%	55%	55%	56%	56%
Administration			38	42	128	140	174	235	274	340	385	434
Net Profit before Interest & Tax			**-6**	**380**	**888**	**1859**	**3849**	**7441**	**12881**	**20324**	**28728**	**39310**
Interest			0	20	26	30	39	43	69	95	133	169
Net Profit before Tax			**-6**	**360**	**862**	**1829**	**3810**	**7398**	**12812**	**20229**	**28595**	**39141**
Provision for Tax	30%		0	106	259	549	1143	2219	3844	6069	8578	11742
Net Profit after Tax			**-6**	**253**	**603**	**1280**	**2667**	**5179**	**8969**	**14160**	**20016**	**27399**
% of Sales			-6.3%	29.0%	30.2%	33.3%	35.9%	36.9%	37.5%	37.9%	38.2%	38.4%
Cash Flow Projections ($'000)												
Operating Cash Flow												
Receipts:												
Sales Receipts				95	873	2001	3842	7427	14025	23940	37365	52455
Payments:												
Operating Costs (excl Depreciation)			63	412	937	1784	3320	6257	10637	16489	23065	31247
Administration			38	42	128	140	174	235	274	340	385	434
Interest			0	20	26	30	39	43	69	95	133	169
Tax			0	80	220	476	994	1950	3438	5512	7951	10951
Net Operating Cash Flow			**-100**	**-460**	**-438**	**-430**	**-686**	**-1059**	**-393**	**1503**	**5830**	**9653**
Non-operating Cash Flow												
Receipts:												
Debt Funding Received			224	61	63	138	90	349	358	530	525	500
Payments:												

Capital Expenditure			515	83	90	333	152	795	836	1283	1229	1260
Repayment of loan principal			0	26	40	51	63	71	104	141	180	227
Net Cash Flow			**-392**	**-508**	**-505**	**-675**	**-811**	**-1576**	**-975**	**609**	**4947**	**8667**
Cumulative Cash Flow			-392	-900	-1405	-2080	-2891	-4467	-5442	-4832	115	8781
Internal Rate of Return		50.4%			**Price of Oil ($/kg)**							
				50%	$ 10.00	$ 12.50	$ 15.00	$ 17.50	$ 20.00			
			Cost	$4.00	43%	57%	69%	78%	87%			
			of Fruit	$5.00	32%	47%	59%	70%	78%			
			($/kg	$6.00	22%	38%	50%	61%	70%			
			oil	$7.00	13%	29%	42%	53%	63%			
			content)	$8.00	5%	21%	34%	45%	55%			
Equity Capital Required ($m)		5.442			**Price of Oil ($/kg)**							
				5.4	$ 10.00	$ 12.50	$ 15.00	$ 17.50	$ 20.00			
			Cost	$4.00	5.5	2.8	1.7	1.2	1.0			
			of Fruit	$5.00	9.9	5.3	3.1	1.9	1.3			
			($/kg	$.00	19.0	9.5	5.4	3.3	2.2			
			oil	$7.00	29.3	15.4	9.2	5.6	3.6			
			content)	$8.00	39.6	25.7	13.7	8.9	5.8			
Debt Funding Assumptions												
Debt Funding Received												
Land		60%	18	0	0	0	0	0	0	0	0	0
Buildings		50%	85	0	0	25	10	135	75	275	125	150
Plant & Equipment		33%	96	11	13	83	25	154	198	235	285	300
Office Equipment		100%	5	5	10	10	10	20	20	20	30	30
Vehicles		100%	20	45	40	20	45	40	65	0	85	20
Total Debt Funding Received			**224**	**61**	**63**	**138**	**90**	**349**	**358**	**530**	**525**	**500**

Debt Balance												
Land			18	18	17	16	14	13	12	12	11	10
Buildings			85	85	77	93	95	221	287	539	636	732
Plant & Equipment			96	107	110	183	198	333	511	713	947	1176
Office Equipment			5	10	18	25	29	41	51	57	70	81
Vehicles			20	65	100	104	124	138	172	137	179	165
Total Debt Balance			**224**	**285**	**322**	**421**	**460**	**746**	**1033**	**1459**	**1844**	**2164**
Re-payment of Principal												
	Term											
Land	15		0	1	1	1	1	1	1	1	1	1
Buildings	10		0	9	9	8	9	10	22	29	54	64
Plant & Equipment	10		0	10	11	11	18	20	33	51	71	95
Office Equipment	3		0	2	3	6	8	10	14	17	19	23
Vehicles	4		0	5	16	25	26	31	34	43	34	45
Total Principal Re-paid			**0**	**26**	**40**	**51**	**63**	**71**	**104**	**141**	**180**	**227**
Payment of Interest												
Prime Interest Rate	7.50%											
	Premium	% pa										
Land	0.75%	8.25%	0	1	1	1	1	1	1	1	1	1
Buildings	1.25%	8.75%	0	7	7	7	8	8	19	25	47	56
Plant & Equipment	1.75%	9.25%	0	9	10	10	17	18	31	47	66	88
Office Equipment	2.00%	9.50%	0	0	1	2	2	3	4	5	5	7
Vehicles	2.50%	10.00%	0	2	7	10	10	12	14	17	14	18
Total Interest Paid			**0**	**20**	**26**	**30**	**39**	**43**	**69**	**95**	**133**	**169**