

Agri-Business, Production, Processing and Marketing Information News

Issue No 21

June 1994

AgEnt 62-94

Features

A collection of topical articles/material covering sectors where AgEnt is currently assisting clients or where potential clients have made enquiries.

- VANILLA
- FRUIT LEATHERS, BARS AND ROLLS
- ORGANIC PRODUCTION STANDARDS
- AROMATHERAPY (PURE ESSENTIAL OILS)
- FORCED AIR COOLING
- NEW ZEALAND STRAWBERRY EXPORTS

*Prepared by Anthony Dalgleish
International Marketing/Agro-Processing
Advisor.*



HELPING SRI LANKA TO GROW !

AgEnt is a dynamic USAID funded private sector agro-enterprise development initiative successfully assisting companies and entrepreneurs with viable business/marketing plans to expand existing operations or start-up new ventures targeted at both domestic and export markets.

Agri-Business, Production, Processing and Marketing Information News

Issue No 21

June 1994

AgEnt 62-94

Index

Introduction and Qualifications	1
Contents	
A. Vanilla - a New, Potential High Value Export Crop	1
B. Fruit Leathers, Bars and Rolls - A New, Fast Expanding Developed Countries Market Sector	2
C. New Zealand Certified Bio-Gro Organic Production Standards	2
D. Aromatherapy - Pure Essential Oils Another Burgeoning Developed Countries Market Sector	3
E. Forced Air Cooling of selected export fruits/vegetables	3
F. New Zealand Strawberry Industry Review - brief SWOT Analysis of Export Marketing Potential etc	4

Editorial Board: Richard Hurelbrink - Managing Director/Agribusiness Advisor and Anthony Dalglish - International Marketing/Agro Processing Advisor. BIC Manager: Mrs. Gayatri Abeydeera.

Agri-Business, Production, Processing and Marketing Information News is published by the USAID funded Agro-Enterprise Development Project (AgEnt) as part of its overall program to assist companies and entrepreneurs with viable business/marketing plans to expand existing operations or start-up new ventures targeted at both domestic and export markets.

Correspondence should be addressed to the Manager, Business Information Center, AgEnt Project, 5th Floor Deutsche Bank Building, 86 Galle Road, Colombo 3, Sri Lanka. Telephone: 94-1-446447, 446420, Fax: 94-1-446428. E-Mail: (Internet) agent@agent.lk.

1. INTRODUCTION AND QUALIFICATIONS

AgEnt's BIC (Business Information Center) regularly produces and sends to existing and potential clients, government and other identities specially prepared reports covering a wide range of agro-enterprise sector issues and opportunities. Many company executives/entrepreneurs and public sector organizations visit the center to conduct "first hand" market research on their specific areas of interest.

The center maintains an up-to-date collection of hard back publications, international trade magazines and product sector trend reports, linked to an international information network capable of accessing a wide range of production, post harvest handling, processing, marketing and agri-business topics.

This report is essentially a collection of topical articles/material covering the following sectors where AgEnt is currently assisting clients or where potential clients have made enquiries.

2. CONTENTS

A. Vanilla - A New, Potential High Value Export Crop

AgEnt is playing a key pro-active development role designed to establish this crop as a major new "high value/volume export sector for Sri Lanka".

The vanilla sector articles/other material which appear under the appendices below have been selected to give those identities involved and/or interested in this sector a much better understanding of the "wider dynamics of the crop", bearing in mind that in an earlier BIC report we majored on the growing of vanilla.

AgEnt also has for sighting in the BIC an up-to-date "assessment of the world market for vanilla":.

- Appendices A1-6 : Vanilla - our most popular flavor.
- Appendices A7-10 : Vanilla and its place in history.
- Appendices A11-12 : Background memorandum on vanilla.
- Appendices A13-14 : Where do vanilla beans come from ?
- Appendices A15 : Which bean ? (Vanilla bean varieties).
- Appendices A16-17 : The Vanillamark means real vanilla flavor.

- Appendices A18-20 : Vanillamark gives products competitive edge.
- Appendices A21 : Consumer alert - Mexican vanilla only seems like a bargain !
- Appendices A22 : Why participate in the new Vanillamark program ?
- Appendices A23 : Tips for using vanilla beans.
- Appendices A24 : Quick tips for using pure vanilla extract.
- Appendices A25 : United States promotion of Bourbon variety vanilla ex the French Indian ocean islands.
- Appendices A26 : United States media/cooperative advertising material.

B. Fruit Leathers, Bars and Rolls - A New, Fast Expanding Developed Countries Market Sector

Notwithstanding the growth which is taking place in many developed countries for dried tropical fruits (i.e. pineapple, mango, papaya etc), the fastest akin growth sector is in "fruit leathers, bars and rolls". The appendices below are black/white reproductions of the outside of consumer cartons and internal/individual bar wrappers for a number of leading Australasian brands.

The BIC has samples of both the brands below for evaluation by Sri Lankan companies interested in exploring this new, high growth potential export sector.

- Appendix B1 : Outside carton (pack) for "TASTI" brand tropical fruit bars.
- Appendix B2 : Outside carton (pack) for "UNCLE TOBY'S" brand real fruit roll-ups.
- Appendix B3 : Internal/individual bar wrappers for B1/B2 brands.

C. New Zealand Certified Bio-Gro Organic Production Standards

As AgEnt is working with a number of clients exporting certified organically grown fruit products, we have reproduced below the latest New Zealand Biological Producers Consumers Council (Inc) standards, as this

country is one of the leaders in setting such standards and exporting organically grown products.

The appendices below cover New Zealand standards relating to -

. Definitions . Permitted . Restricted . Interim animal health remedies . Quarantine area . Prohibited . Location, conversion and quality of land . Residue or contamination levels in produce . Livestock production . Poultry and egg production . Cropping . Vegetable and fruit production . Inspection and regulation . Progress towards bio-gro . Processed food products . Packaging guidelines . Processing dairy products . Meat processing . Processing grains and other arable produce . Processing vegetable and fruit products . Honey and honey dew production . Residue levels in certified systems . Interpretation

Appendices C1-C2 : New Zealand Biological Producers Consumers Council (Inc) - Certified Bio-Gro Organic Production Standards.

D. Aromatherapy - Pure Essential Oils - Another Burgeoning Developed Countries Market Sector

The appendices below illustrate -

- How one Australasian company promotes aromatherapy (i.e. the use of pure essential oils).
- The immense range/claimed propensities of the essential oils products mix they are selling.

As Sri Lanka already produces a number of these essential oils, linked to the capability to produce others, AgEnt believes the sector has considerable untapped export potential.

Appendices D1-13 : The Oil Company's "Aromatherapy consumer information/ promotional brochure".

E. Forced Air Cooling of Selected Export Fruits/Vegetables

Extracts from the Australian publication below on "Forced air cooling/design of forced air coolers" could be of considerable interest to those identities contemplating export of "quality/high value" export vegetables in particular.

Appendices E1-33 : Queensland Development of Primary Industries booklet on " Forced air cooling". Appendices 24/27 have been purposely deleted.

F. New Zealand Strawberry Industry Review - Brief SWOT Analysis of Export Marketing Potential etc.

Sri Lanka is already growing strawberries for export in a small way and New Zealand strawberry growers believe that there is still an untapped potential for high quality/high value strawberry exports into Hong Kong, Singapore, UAE, Saudi Arabia etc.

The review below should assist potential Sri Lankan strawberry growers/exporters to "get a better feel for the volume/value potential in these selfsame markets, which are but a stone's throw away compared to New Zealand's considerable distance from these markets".

Appendices F1-10 : New Zealand strawberry industry review (draft; March 1993)

TEXT REPRINTED FROM:

A PUTMAN PUBLICATION
MAY 1968
VOL. 49
NO. 5

Food Processing

THE MAGAZINE OF THE FOOD INDUSTRY.

Vanilla— our most popular flavor

FRAN LaBELL, Eastern Editor

Vanilla has gotten an undeserved reputation as the "plain" flavor, perhaps because it is so popular and is used in so many food applications that people have started to take it for granted. In fact, vanilla is far from plain. It is a complex, natural flavor whose production is as labor intensive and exacting as making fine wine—and as time consuming, also.

The most often used form of natural vanilla is pure vanilla extract, made from vanilla beans. Its flavor can be described as sweet, with a creamy richness in the background and a warm, resinous aftertaste which is almost balsamic in character. Almost 200 chemicals have been identified in natural vanilla. The predominant one is vanillin (approximately 2%), which contributes a very strong flavor impact. The rest of natural vanilla's character is attributed to the many other chemicals present in smaller amounts.

By far the most popular flavor among Americans is vanilla. If all forms of vanilla flavors are counted—pure vanilla extracts, vanilla flavors, vanilla-vanillin flavors, artificial vanilla flavors, and natural vanilla powders—it outsells all other flavor categories. A breakdown of uses for natural vanilla extract shows that most of it goes into ice cream (about 44%). Retail sales of extract for home use accounts for 22% of natural vanilla. Seventeen percent is found



(PHOTO COURTESY OF VANILLA INFORMATION BUREAU, INC.)

in cola beverages and another 17% is used in confections, baked goods, alcoholic beverages, and other food products.

Ice cream favorite

Despite the profusion of ice cream flavors available today, Americans still choose vanilla ice cream 31% of the time. Nearly 403 million gallons of vanilla ice cream are consumed each year. According to FDA Standards of Identity for ice cream, vanilla ice cream must fall into one of three flavor categories. Category I, called Vanilla Ice Cream, must be flavored with pure vanilla. Category

II, Vanilla Flavored Ice Cream, is flavored with vanilla-vanillin extract. The vanilla-vanillin extract may contain 1-oz of synthetic vanillin for one fold of natural vanilla extract. Category III, Artificially Flavored Vanilla Ice Cream, applies to a flavor that is more than 50% artificial. About 20-25% of vanilla ice cream is Category I. About 45-50% is Category II, and about 25-35% is Category III.

Vanilla plays an important role in the flavor systems of foods. At times it is the star, as in vanilla ice cream or cream soda. It may also be a supporting cast member to chocolate, for which it supplies roundness, adds mellow back-

ground notes, and smooths bitter notes. For cherry, berry, and other fruit flavors, it is an enhancing, enriching background note. Many carbonated soft drinks, especially colas, use vanilla for smoothing and enriching background notes as well.

Vanilla is most often used in sweet foods and with sweet flavors. It enhances the sweetness of these foods and may enable the food technologist to reduce the amount of sugar used in a formulation where the sugar does not play a functional role, such as a bulking agent. The amount of sugar in a beverage or a sauce may be reduced, thus eliminating



(PHOTO COURTESY OF VANILLA INFORMATION BUREAU, INC.)

some of the calories. For example, in chocolate beverages the sweet notes of the vanilla extract counter the slightly bitter notes of the chocolate and enhance the overall sweetness. Approximately 10% less sugar may be used in a chocolate beverage when vanilla is added.

Another characteristic of natural vanilla extract is that it gives food pleasant flavor effects over a wide range of usage levels. When vanilla levels are increased, it results in a more pronounced vanilla flavor, but it does not produce harsh notes or off-notes. The optimum usage levels to achieve the desired flavor levels in individual systems should be determined for the most economical use of natural vanilla.

Use of natural vanilla extract is increasing due to the continuing emphasis on natural flavors and the continuing interest in gourmet foods. The largest growth area for natural vanilla extract is vanilla ice cream, a category which already represents the greatest use. Premium and high butterfat brands using natural flavors and high quality ingredients continue to appear in the marketplace. Producers of high quality baked goods, natural carbonated beverages, and confections are also using vanilla extract.

New to savory foods

A new trend heartening to vanilla lovers has started in the restaurant world. Vanilla is usually used in sweet foods, but many gourmet and nouvelle cuisine chefs are also using it in savory foods. Vanilla's sweet notes compliment the sweetness of shellfish such as shrimp, scallops, or lobster, and it has been served in sauces for various kinds of fish. White meats (i.e., chicken, veal) are also served with vanilla flavored sauces. Soups, salad dressings, and vegetable dishes are flavored with vanilla. In savory dishes, vanilla provides smooth, rich background flavor notes and enhances food flavors. Vanilla has been combined with ingredients



(PHOTO COURTESY OF VIRGINIA DARE EXTRACT CO.)

such as ginger, shallots and white wine, curry, fruit and nuts, citrus, fennel, and even teriyaki in some dishes. This trend has not yet appeared in the processed or prepared food industry, but it could in the future.

Vanilla worldwide

The first vanilla beans were grown in Mexico and their cultivation eventually spread to other areas of the world with favorable climates. The orchid which produces the vanilla bean is the only orchid to produce an edible fruit. The country of Madagascar, the

world's fourth largest island which lies off the coast of Africa in the Indian Ocean, is the world's largest grower of vanilla (producing 75% of the world supply). Madagascar, Comores, and Reunion produce what is known as Bourbon vanilla, which many people consider the world's finest. It is called Bourbon vanilla because Reunion, a former French possession where vanilla was first grown commercially in the 19th century, was known as the Isle de Bourbon. Other important vanilla growing areas include Indonesia, Tonga, Tahiti, and Mexico.

Aztec Indians of Mexico were the first people to use vanilla as an edible product. They gave the best beans to their ruler in tribute, and when Cortes explored Mexico for Spain in 1518, he observed Emperor Montezuma drinking a chocolate beverage flavored with vanilla from a golden goblet. Aztec herbals prescribed vanilla as an ingredient in a strengthening, revitalizing elixir. The Spaniards brought chocolate and vanilla back to Europe and drinking chocolate beverages flavored with vanilla became very popular. In England, the apothecary to Queen Elizabeth I endorsed vanilla alone as a flavoring and the Queen became very fond of it.

Mexico was the only source of vanilla for 300 years. Attempts to grow the orchid in other lands with compatible climates were eventually successful, but the plants never produced a vanilla bean. In 1836, a Belgian, Charles Morren, noticed that Mexican vanilla flowers were pollinated by the tiny Melipone bee, which was not found outside Mexico. He realized that the flowers could be hand pollinated and thus made it possible to grow vanilla beans in other countries.

Costly process

The cultivation and processing of vanilla beans is an expensive and laborious process. Flowers of the orchid vine which produce vanilla are only open for part of one day and only appear during a two-month period—when workers must visit the vines each day. Each flower which is successfully pollinated grows to a pod 6-10" long in about 6 weeks. The pods are ready for harvest after about 9 months.

The green beans must be cured properly to develop vanilla flavor and aroma. In the Bourbon vanilla bean growing islands and in Tahiti, the beans are immersed in hot water to start the curing process. In Mexico, they are heated in ovens. Beans are alternately dried in the sun and wrapped in

blankets to allow them to sweat for 3-6 mo for the fermentation process to progress properly.

Biotechnology studies

Scientists specializing in biotechnology have been working for several years with vanilla plants to improve and optimize the vanilla flavor. They use tissue culture techniques to propagate vanilla plant cells with desirable flavor characteristics. They are studying the flavor precursors in the plant material with an objective of developing plant cell cultures which produce vanilla flavor components.

Vanilla buyers look for beans with high vanillin content because vanillin is one of the major contributors to vanilla flavor. High vanillin content also indicates that the bean was picked when mature and cured properly, both factors which allow all of the flavor components to develop. Beans are also chosen which have approximately 25% or less moisture (further evidence of proper curing). There is less chance of the beans becoming moldy in transit or storage if the moisture content is low. Properly cured beans will keep for several years.

U.S. vanilla supply

Vanilla producers in the United States import about 70% of their beans from the Bourbon vanilla bean growing islands. Bourbon beans are noted for their flavor and quality. In 1986, 70% of the American supply (1,541,391 lb) was

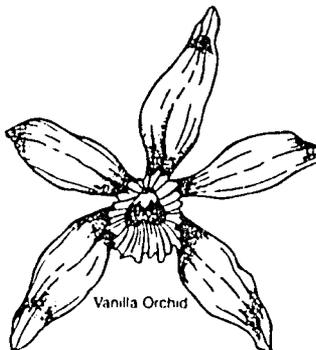
Bourbon beans. Indonesia supplied 28% (624,850 lb). Indonesian beans (sometimes referred to as Java beans) are less expensive than Bourbon beans, due in part to inconsistency in vanillin content from lot to lot. They also yield a smokey flavor note due to curing over wood fires.

Most of the world's vanilla beans are produced by orchids from the species *Vanilla planifolia* Andrews. Tahitian plants (producing about 0.1% of the beans imported into the U.S.) are from the species *Vanilla tahitensis* Moore and produce beans with a different chemical composition. Tahitian beans are claimed to have their own distinctive flavor with a very flowery character and a pronounced heliotrope note.

Mexican beans were unavailable for export for many years because the small supply was used by the domestic market. Only during the past couple of years have small numbers of beans been exported by Mexico. In 1986, that amounted to 3,505 lb or 0.1% of the U.S. supply. Mexico is now developing its vanilla bean production because it is considered a valuable income producing crop. As evidence of that, they exported about 10 tons in 1987.

While the quality of vanilla beans from Mexico is considered acceptable, vanilla extracts from Mexico are not. FDA has cautioned against using extract from Mexico because some is adulterated with coumarin (banned as a carcinogen in the U.S.). Consumers who travel to Mexico and are enticed by the low prices of vanilla extract there are discouraged from buying it because of the possible adulteration.

Vanilla extract producers in the U.S. make their extracts from beans of either one source or from blends. Beans are a natural product which vary according to local soils, weather conditions, and curing processes, and therefore yield a variety of flavor notes. Some vanilla producers use only Bourbon beans. Others make Bourbon vanillas as well as vanillas from a



Vanilla Orchid

blend of beans from different sources. Hundreds of blends are possible and producers can create whatever blends a food processor may desire in flavor.

Vanilla extract is generally made by a percolation process. Beans are chopped into fine pieces and a menstruum of ethyl alcohol and water is circulated through them. The menstruum is pumped through under controlled temperatures and pressures. The process takes place in a sealed chamber to contain the delicate volatiles. Gentle processing conditions are important to optimize flavor.

Many of the flavor components in the vanilla bean are hydro-

phobic but they are soluble in alcohol. Vanilla extract is an ideal form of natural vanilla flavor to use in aqueous food systems because it insures that the flavor components are dispersed uniformly throughout the food. The beans themselves contribute flavor, but not as efficiently as the extract. Major use in food is for visual effect in Philadelphia-style vanilla ice cream. Vanilla extract can be kept for many years and the flavor mellows and improves with age.

Standards of Identity

There are rules governing the production of vanilla extract and the other forms of vanilla flavor. Vanilla is the only flavor with a federal Standard of Identity. Sin-

gle-fold vanilla must contain 35% alcohol by volume. It must contain the sapid and odorous principals extractable from 13.35 oz of vanilla beans and 25% moisture per gallon. Two-fold vanilla has the extractables from 26.7 oz of vanilla beans and 3-fold vanilla has the extractables from 40.05 oz. Direct percolation is used for single, double, and triple fold vanilla. With more concentrated vanillas, a concentration step is needed to remove the solvents. Some aroma is sacrificed in this process. Two-fold vanilla extract is the product most often used by the food processing industry. Retail vanilla is single-fold.



(PHOTO COURTESY OF VANILLA INFORMATION BUREAU, INC.)

Vanilla flavor conforms to the same standards as vanilla extract, except it has less than 35% alcohol by volume.

Vanilla powder is a mixture of ground vanilla beans or vanilla oleoresin or both on a carrier (usually sucrose or dextrose). Lactose, food starch, dried corn syrup, and gum acacia are also permitted by the standard. The powder is used in dry mixes for such products as cakes, puddings, pie fillings, or beverages. When a fat-based food system is involved, the powder can be used to disperse the flavor uniformly throughout the system.

Vanilla-vanillin extract consists of vanilla extract plus added vanillin. Not more than 1 oz of vanillin may be added for each fold of

vanilla extract. One ounce of vanillin added to a single-fold vanilla makes a 2-fold vanilla-vanillin extract. Two-fold vanilla extract with 2 oz of added vanillin is a 4-fold vanilla-vanillin extract.

Artificial vanilla flavors may or may not contain any natural vanilla extract. They are often based on vanillin and/or ethyl vanillin. Flavorists use their artistry in choosing many flavor components for developing artificial vanilla flavors. Vanilla extenders are also available which do not contain any natural vanilla.

Vanillin, the principal flavor component of vanilla, can be produced synthetically from lignin. Most synthetic vanillin is a by-product of the pulp and paper industry and is made from waste sulphate which contains lignin-sulfonic acid.

Market changes

For many years, the vanilla market was steady with the price of vanilla beans ranging from \$8-10/lb. Then in 1964, the government of Madagascar started to control the marketing of vanilla beans. By 1977, beans were selling for about \$12/lb under a government marketing plan. A combination of curtailed acreage, economic conditions, and bad weather in 1979 and 1980 led to a vanilla bean shortage. Supplies were available to only meet half of the world demand. Prices of beans shot up as a result, with Bourbon beans at a high of \$55-70/lb in 1980. U.S. imports for 1978 were close to 1000 tons. In 1979, it slipped to 500 tons and in 1980, it hit a low of 343 tons. Since 1981, when the U.S. imported 640 tons, the yearly imports have gradually recovered—reaching 1,387 tons in 1987.

Food processors, faced with very high prices for natural vanilla in 1979-80, turned to vanilla extenders and artificial vanilla flavors to meet their needs. It was estimated that 33% of the natural vanilla extract market turned to substitutes. Since that time, supplies have gradually recovered and

the current price of Bourbon vanilla beans is about \$37/lb. Some, but not all, formulations have returned to using vanilla extract.

Certification program

The vanilla industry has a certification program for food processors wishing to tell the consumers about the flavoring in their products. Vanillamark is a symbol which can be displayed on retail products and states that they contain "100% Real Vanilla from Bourbon Beans." Products are qualified to use the mark by the Vanilla Information Bureau in New York City, which represents Univanille International. This organization is composed of the vanilla growers of Madagascar, the Comores, and Reunion—growers of Bourbon vanilla beans.

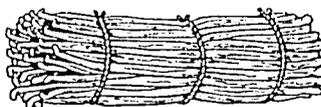
To apply for the Vanillamark, the food processor certifies that the vanilla in a particular product comes from pure vanilla extract or powder made from Bourbon beans or the Bourbon vanilla beans themselves. A supplier invoice for the vanilla being used in the product must be sent to an independent accounting firm which will preserve confidentiality. A 4-oz sample of the vanilla used in the product is sent to the Vanilla Information Bureau, which has it tested by an independent labora-

tory.

An analytical method for testing the authenticity of natural vanilla extract has been developed. The method is capable of determining the origin of the vanillin in a vanilla extract or product, according to a published description of the test. The SIRA method is described in an article, "Isolation and Stable Isotope Ratio Analysis of Vanillin," by Patrick G. Hoffman and Mary Salb in the *Journal of Agricultural Food Chemistry* (Vol. 27, No. 2, 1979, pp 352-255). Food processors who fulfill the conditions are awarded the certification and permitted to display the Vanillamark symbol on their product's

package.

Additionally, the applicant agrees that when the methodology is developed, the Vanilla Information Bureau can pick up retail product samples without notice and have them tested for the integrity of their vanilla content by an independent laboratory. The methodology for testing for vanilla in finished products has not yet been perfected.



BUNDLE OF VANILLA BEANS



(PHOTO COURTESY OF VANILLA INFORMATION BUREAU, INC.)

Further information on real vanilla and the new Vanillamark program is available from the Vanilla Information Bureau, Inc., 928 Broadway, New York, N.Y. 10010



VANILLA INFORMATION BUREAU, INC.

BROADWAY • NEW YORK, NEW YORK 10010 • 212-420-9364



VANILLA AND ITS PLACE IN HISTORY

The Aztec Indians in Mexico discovered as early as the 16th century that the seemingly inedible fruit or beans of a tropical orchid, when cured by months of heat and humidity, acquired an exotic aroma. Not only was vanilla considered a wonderful flavoring for foods and beverages, but from the 16th to the 19th centuries it was considered to be an aphrodisiac and to have therapeutic values, good for everything from aiding digestion and preventing headaches to counteracting poisons and bites. The Aztecs called these brown beans "tlilxochitl"--the Aztec word for "black flower"--and required the Totonac Indians who produced them to give some of the finest pods to the emperor Montezuma as a tax payment.

In 1518, while the Spanish Conquistador Cortez was seeking the treasures of the New World, he observed the Aztec emperor Montezuma enjoying a royal beverage of vanilla-scented chocolate. He was so impressed by this kingly drink that when he and his men returned to Europe they brought bags of cocoa and vanilla along with the gold, silver, and jewels of Montezuma's fallen empire.

Within half a century after Cortez made his discovery, Spanish factories were preparing vanilla-flavored chocolate and

for some time Europeans continued to use vanilla only in combination with the cocoa bean. In 1602, however, vanilla began to be used as a flavoring on its own--the suggestion of Queen Elizabeth's apothecary, Hugh Morgan. Since then vanilla has soared in popularity, making it far more popular than chocolate or any other flavor known before or since.

For more than 300 years after its discovery by Cortez, vanilla was produced only in its native Mexico. Plantings were tried in many other countries, but the delicate orchid never bore fruit. The mystery was not solved until 1836, when a Belgian named Charles Morren found that common insects cannot pollinate the vanilla orchid. He observed that a tiny bee, the Melipone, which is found only in the vanilla districts of Mexico, is uniquely equipped to bring the plant to fertilization. The bee did not thrive outside Mexico and so Morren developed a method of hand-pollinating vanilla blossoms.

Shortly after Morren's discovery, the French started to cultivate vanilla on many of their islands in the Indian Ocean, East and West Indies and French Oceania; the Dutch planted it in Indonesia and the British in southern India.

Eventually, the French took vanilla to Reunion, an island off Madagascar's east coast. There, a former slave named Edmond Albius perfected a quick and simple method of manual pollination which is still used to this day. This was the impetus of major commercial cultivation in the Indian Ocean area.

Up until the 19th century, the beans were the only form of

vanilla available. As with most spices they were sold mostly in apothecary shops and usually only in major cities. When Thomas Jefferson returned to America from a stint as ambassador to France, he brought with him a new-found love of vanilla, but soon learned that the beans were not even available in Philadelphia. Among his papers there is a letter asking a friend in Paris to send him a supply.

In the early 1800's vanilla extract (or "tincture of vanilla" as it was often called) began to appear in the U.S. While this was still mainly a druggist's product until later in the century, the first flavoring extract manufacturer started selling it through grocery stores as early as 1847. Unlike Europeans, who continued to use vanilla beans, Americans took quickly to the convenience of pure vanilla extract and soon made it our most common form of natural vanilla. The beans became a product available only in fancy food stores and in some premium spice lines. This is largely true today.

Vanilla became so popular in Europe and the U.S. that by the end of the 19th century chemists had devised ways of imitating it. Vanillin--the principal (but by no means the only) flavor constituent of vanilla--was first synthesized commercially from clove oil, then saffrole and coal tar and more recently from the sulphite liquor which is a by-product of pulp paper manufacturing. Today, wood pulp is by far the major source of synthetic vanillin -- the basis of imitation vanilla.

When the cheap artificial flavor was introduced, it was

often used to adulterate real vanilla extracts and to replace them entirely in many manufactured foods.

Finally, in 1962 the Food and Drug Administration established standards to protect the integrity of pure vanilla extract, and many manufacturers of high quality ice creams and other food products returned to pure vanilla. Today, the finest products are made with real vanilla, and consumers at home prefer it nine-to-one for their baking and dessert making. However, the majority of manufactured products contain the cheap, synthetic vanillin.

Alert consumers can be forewarned of the products which use artificial vanilla by studying the ingredient statements. Quality conscious companies that are insisting on using "Bourbon" vanilla (the choicest type, which comes from the Indian Ocean area) are also beginning to display a seal called the Vanillamark. This is licensed to them by Univanille, an organization of Bourbon vanilla producers. Bourbon vanilla, incidentally, is no relation to the whiskey. It is simply a trade term which came from the fact that Reunion--where Indian Ocean vanilla originated--was known as the Bourbon Isle.

VANILLA INFORMATION BUREAU, INC.

BROADWAY • NEW YORK, NEW YORK 10010 • 212-420-9364



THE VANILLAMARK

BACKGROUND MEMORANDUM

VANILLA

* Most of the world's real vanilla comes from the earth's fourth largest island --Madagascar-- and its neighboring islands, The Comores and Reunion. These Indian Ocean producers lie off the east coast of Africa.

* The product of the Madagascar area is known in the vanilla business as "Bourbon vanilla." This takes its name from the "Bourbon Isle" --Reunion-- where vanilla was first grown commercially in that area in the early 19th century.

* Bourbon vanilla is recognized as the premier vanilla in commerce today by virtue of the lengthy curing it is given and its high natural vanillin content.

* Vanilla is our most popular flavor, but many Americans rarely taste real vanilla.

* Much of what we assume is vanilla and loosely call "vanilla" is really artificial. Labels must state the artificiality but consumers often overlook it.

* Fortunately, American consumers will soon have an easy time identifying those high quality products (ice creams, yogurts, cookies, cakes, etc.) which contain real vanilla. The

- 2 -

vanilla producers of the Indian Ocean area are awarding real vanilla products a Vanillamark which says it very clearly, "100% real vanilla." The mark is based on product testing and a continuing program of surveillance.

* For all its exotic background and perennial popularity, vanilla has a frustrating image problem: Because vanilla ice cream is pale colored and relatively mild in flavor, the word "vanilla" is often used to denote something "plain" or "common" or "bland." The users really mean "plain vanilla ice cream," but rarely spell that out. Unfortunately, vanilla the exotic flavor takes an undeserved rap.

* Smell a vanilla bean or a pure extract of vanilla and you'll never even be tempted to say "plain vanilla." This is a strong, highly aromatic flavor that is anything but "plain."

VANILLA INFORMATION BUREAU, INC.

BROADWAY • NEW YORK, NEW YORK 10010 • 212-420-9364



THE VANILLAMARK

Contact: Alison Greene

WHERE DO VANILLA BEANS COME FROM?

MADAGASCAR, REUNION, AND THE COMORES ISLANDS produce about 1,000 tons of vanilla beans each year, or approximately 80% of the world's supply of vanilla. To give you an idea of how these beans, known as "Bourbon beans" are produced, here is a brief overview of the laborious and time consuming process involved in bringing vanilla beans to market:

- * Vanilla comes from a tropical orchid -- the only orchid variety to bear an edible fruit.
- * The beans thrive in hot, humid climates and grow on vines that climb and attach themselves to trees.
- * After two to three years, after extensive cutting and pruning, the vanilla orchids appear on the vines.
- * What is particularly unusual about vanilla is that each vanilla orchid must be pollinated by hand. Since the blossoms last only one day, they must be pollinated promptly or they will be lost.
- * Two months after fertilization, the beans are fully grown, but they will only be collected some five to seven months later when they fully mature and their color changes to a brighter green.
- * In Madagascar and The Comores, where the beans are quite valuable and subject to theft, many growers mark the pods with pinpricks for a distinctive brand.
- * When ready for harvest, each bean is picked by hand. It is strange but even at this stage the beans have no hint of their characteristic flavor and aroma.
- * Once collected, the fermentation or curing process begins, and can take another six months.
- * The first step involves blanching the beans in boiling hot water for three minutes to halt the enzymatic growth process and stop further ripening.

- * At that point the beans are wrapped by night in blankets and put in sweating boxes to drain their moisture.
- * For about a week the beans are sweated by night and dried by day. A natural chemical reaction occurs which turns the green beans to brown.
- * In some cases the beans are put in warm ovens for a day or two and then placed out in the sun to dry for the remainder of the week.
- * In other cases they are immediately placed in the sun and layed out to dry for the whole seven days.
- * Then, as the last stage in the drying process, the beans are air-dryed in racks for about a month.
- * The dried beans are then sorted for quality and stored in boxes for about three months to develop their flavor.
- * Finally, all the beans are measured and categorized, then bound in bundles to be ready for sale.

VANILLA INFORMATION BUREAU, INC.

BROADWAY • NEW YORK, NEW YORK 10010 • 212-420-9364



THE VANILLAMARK

CONTACT: ALISON GREENE

WHICH BEANS?

There are various types of vanilla beans on the U.S. market today. Here is a rundown:

BOURBON: This is the trade term for beans from the Indian Ocean producers (Madagascar, Reunion, and The Comores). Because this area produces 75 percent of our vanilla, Bourbon beans are the most important type. They are also recognized as the finest in flavor because of their high natural vanillin content, which is developed by the producers' long curing process.

JAVA: These beans come from Indonesia, our second most important source. Java beans are less expensive than the Bourbons because they have a much lower vanillin content and a characteristically smokey flavor (wood fires are part of their curing procedure).

MEXICAN: This is the native land of vanilla and its beans (not to be confused with its cheap extract products) are about equivalent of Bourbons in vanillin content. However, the industry there has declined to the point where Mexico only supplies less than one percent of our vanilla today.

TAHITIAN: This bean comes from a different species of orchid than the other beans of commerce. It is a fatter and moister bean, but the moistness is water, not flavor bearing oils. The vanillin content is much lower than in Bourbon and Mexican vanillas. Moreover, the topnote of its fragrance is heliotropine-like which is not a classic vanilla aroma. In 1987 only about 4 tons of Tahitian beans came into the U.S. (out of 1,200 tons total), so this product is not readily available.

OTHERS: A variety of other countries supply very small quantities of vanilla beans on a somewhat irregular basis. None has any significance in our imports.

VANILLA INFORMATION BUREAU, INC.

BROADWAY • NEW YORK, NEW YORK 10010 • 212-420-9364



THE VANILLAMARK

THE VANILLAMARK MEANS REAL VANILLA FLAVOR

Many brands of ice cream, yogurts, and other food products are beginning to display the Vanillamark on their packages. The symbol signifies that the product is made with 100% real vanilla from Bourbon beans, which in turn is a sign of premium quality throughout the product.

The pure, natural vanilla, which comes from the fruit (vanilla bean) of a tropical orchid, costs considerably more than artificial vanilla (vanillin) and therefore isn't ordinarily used unless the rest of the ingredients are top quality too. Insuring this further is the technical fact that real vanilla is a basically subtle flavor which enhances other pure, fresh flavors but won't mask the foreign or off-flavors which inexpensive ingredients may develop in a product.

The Vanillamark is licensed internationally by the vanilla producers of the Madagascar area. The Indian Ocean producers grow approximately 75% of the world's real vanilla. The symbol is an oval enclosing the word vanilla spelled with an orchid dotting the "i" and two vanilla beans for "l's." Retail product

manufacturers who are awarded the mark must comply with the strict regulations enforced by the Vanilla Information Bureau, Inc. in New York, and must agree to maintain their standards as long as they display the Vanillamark.

VANILLAMARK

Vanillamark

Gives Products Competitive Edge

*Products possessing the new mark must use 100%
"real" vanilla extract*

by **Elise Horner**
Associate Editor

In the ice cream industry, flavor is important "business." While some manufacturers put a great deal of time and money into creating unusual and exotic flavors, other companies invest their resources into perfecting the taste and quality of the more basic flavors.

The most popular ice cream flavor in the United States, is perhaps the most basic of all — vanilla ice cream. According to recent statistics in *The Latest Scoop*, published by the International Ice Cream Association, 31% of American ice cream consumers in 1986, named vanilla their number one choice among ice cream flavors. Hard to believe in a time

when literally thousands of exotic flavors saturate our market? Not really. Vanilla ice cream has been around as long as ice cream itself has been around. And, although consumers will continue to be seduced by dozens of fantastic

flavor concoctions, there remains a loyal market for good old vanilla.

While some may claim that vanilla is vanilla, there is a large scale publicity and advertising campaign headed by Univanille International, national, that would beg to differ.

Univanille International, the marketing organization of Madagascar-area vanilla growers, is sponsoring a major promotion centered around the new and updated Vanillamark.

The new mark strongly resembles the old "100% real" trademark, spell-

ing "vanilla" with two vanilla beans for "l's" and an orchid flower dotting the "i." However, the new registered certification mark has been updated with a new oval design and slogan that reads: "Vanilla Producers Award," indicating that the products possessing the seal have met carefully regulated requirements.

The new Vanillamark program is designed to be more meaningful for manufacturers as well as consumers because it will have stricter requirements. This time the vanilla must not only be "100% real" but all Bourbon. Prior to the new program, manufacturers could receive the old Vanillamark simply by showing proof that it would be used on a Category I ice cream package. What this meant was products could claim to be using 100% real vanilla and in actuality be using artificial vanilla or a combination of real and artificial flavoring.

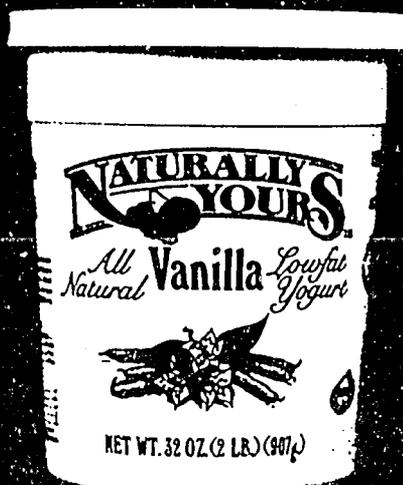
The original Vanillamark is no longer valid and Univanille International has required that it be removed unless the user re-applies and receives certification under the new regulations. Licensing of the new mark will be based on analysis of the extract being used and the program will have a follow-up surveillance procedure in which finished products which have been awarded the mark, will be picked up periodically without notice and analyzed. If at any time the vanilla in the product does not match the quality of the first sample submitted, manufacturers will be required to remove the mark. In addition to supplying a sample of extract, applicants must also include a copy of the supplier's invoice for the vanilla being used in their specific prod-



Kroger, the nation's second largest super-market chain, has become the first firm to display the new Vanillamark on its Deluxe Natural Flavor Ice Cream.

REPRINTED FROM

DAIRY FIELD



THE VANILLAMARK

Naturally Yours Vanilla Yogurt has the new Vanillamark displayed on the side of their containers. Naturally Yours is produced by Bencroft Dairy, Madison, Wisconsin.

ucts. To maintain complete confidentiality, Univanille has appointed an independent accounting firm to review these invoices.

While the note of seriousness attached to the program is indeed intentional, users of legitimate 100% Bourbon vanilla will have no trouble getting permission to use the Vanillamark, assures a spokesperson for the Vanilla Information Bureau, the U.S. representative agency for Univanille International.

Also, the Bureau will give all manufacturers the opportunity to re-submit entries if their original application is rejected. However, there is non-refundable application fee of \$200. "We want everyone who uses a real Bourbon vanilla to have the competitive edge the Vanillamark affords. At the same time, for the sake of consumers and responsible marketers, we will make every effort to reserve the mark for the real thing," explains the Bureau.

Q. What will this entire Vanillamark promotion encompass?

A. Product possessing the new mark will benefit from extensive publicity support being provided by the Vanilla Information Bureau. The campaign, aimed at attracting attention about "real" vanilla, will

include placing four color advertisements during 1987 in the following consumer publications: Bon Appetit, Woman's Day, Redbook, Ladies Home Journal and McCall's. Also, five different trade publications will carry a four color advertisement targeted at manufacturers. In addition, the Vanilla Information Bureau will prepare and distribute six food feature news releases to the food editors of more than 800 daily U.S. newspapers and will work closely with syndicated food columnists to encourage more to be written or said about the vanilla "story."

Q. How will a company/product possessing this seal of approval benefit?

A. The Vanillamark is an opportunity for manufacturers to show customers that their product(s) is made from the best ingredients, including 100% real vanilla. It is more than just a registered certification mark, but an award as well, given to only a select circle of products which comply to strict standards.

As the Dairy Industry is well aware, there is a definite market for high quality "real" ingredients, which appeal to consumers looking for superior taste and trying to eat "naturally" at the same time.

Q. What are the important differences

between real and artificial vanilla flavoring?

A. Creating real vanilla extract is a labor of love. Before the vanilla bean can be picked off of the vine, it takes an entire seven years of planting and cultivating the plant. The vanilla bean is the fruit from an orchid plant which can only be grown in tropical climates such as that of the Madagascar-area, where 80% of the world's real vanilla comes from.

Pure vanilla extract is more expensive than artificial vanilla flavoring since every step of the production process is done by hand. After the bean has been hand-picked, it is percolated with alcohol to be converted into vanilla extract.

While the main flavor constituent of a vanilla bean is vanillin, the bean also contains 100 or more other flavor constituents which contribute to the mellow, well-rounded taste of 100% real vanilla. Synthesized vanillin, which is created in a laboratory, is usually created from either coal tar or a liquor by-product of woodpulp. Synthesized vanillin lacks the 100(+) flavor constituents which are present in a vanilla bean.

According to the Vanilla Information Bureau, real vanilla complements other flavors. For example, The Vanilla Bureau's test kitchen has found that real vanilla mellows the tartness in tart fruits such as in a lemon cake and contributes to the sweetness of sweeter flavors such as strawberries, explains a Bureau spokesperson.

Q. How popular is the flavor of vanilla and what are the different products which it is used in?

Vanillamark continued

Vanilla is loved both nationally and internationally. Not only was vanilla voted Americans favorite ice cream flavor in 1986 and in previous years according to the International Ice Cream Association, but vanilla is also a popular flavor in many other delicious treats. These include: yogurts, cookies, ice milks, puddings, baked goods, frozen novelties, candies, egg-nogs and of course, vanilla extract.

Q. Which manufacturers have already applied and been awarded licenses to use the new Vanillamark?

A. As of April 1, 1987, 12 companies have been awarded licenses to use the Vanillamark for their products: The Kroger Co., Glover's Ice Cream, Seligco Food Corp., Marion-Kay-Reidco, Hendrie's Inc., Safeway Stores, Inc., Jerseymaid Milk Products, Inc., Bancroft Dairy, Weeks Dairy Foods, Inc., Melody Farms, Marco's Gelato D'Italia, and Ala-

mance Foods, Inc. These 12 companies represent approximately 37 different products that will be possessing the new Vanillamark, including frozen novelties, vanilla ice cream, a wide variety of other ice cream "flavors," ice cream bars and sandwiches, yogurt, sundae cups and one application for whipped cream from Alamance Foods in Burlington, North Carolina.

Ken Kuhn, product manager for The Kroger Company, the second largest grocery store chain in the U.S., explained that Kroger's main reason for applying for the new Vanillamark was "to enhance in the consumer's mind the real ingredients that go into our premium products. Just like we use the Real seal for our dairy products, we hope that the Vanillamark will separate us from products that contain artificial flavors and ingredients." Kroger's Vanilla Yogurt and Vanilla French

Vanilla and Neapolitan Ice Creams will possess the new mark on their packages.

William C. Scott, president of Alamance Foods, Inc., explained his reasons for participating in the program. "We are trying to draw attention to the fact that we are making a premium quality product. Our approach was to come out with one of the best products we could and a product as natural as possible. We are hoping the Vanillamark will add credibility to that fact."

The word is out that 100% real Bourbon vanilla makes the difference in both the products we buy and those we make (or bake) ourselves. The Vanilla Information Bureau is hopeful several other companies will apply for the new and improved Vanillamark during this year. ■



FOR FURTHER INFORMATION CONTACT:

VANILLA INFORMATION BUREAU, INC.
928 BROADWAY
NEW YORK, NEW YORK 10010

BEST AVAILABLE DOCUMENT

VANILLA INFORMATION BUREAU, INC.

BROADWAY • NEW YORK, NEW YORK 10010 • 212-420-9364



THE VANILLAMARK

CONSUMER ALERT:

MEXICAN VANILLA ONLY SEEMS LIKE A BARGAIN!

At any price, cheap Mexican vanilla is no bargain. For one thing, most of it is not vanilla at all and it can be dangerous!

While much of the vanilla extract found in Mexico is labeled "pure vanilla extract," most of it isn't (Mexican government regulatory authorities don't seem to notice). The seeming "bargain" tourists speak about is often artificial vanilla extract hopped up with tonka beans which contain a toxic substance called coumarin, that is banned as a carcinogen in the U.S. In the cheapest examples the extract is often totally from tonka beans. For some time, the FDA has been stopping commercial shipments at the border. More recently, they went a step further and bluntly cautioned U.S. tourists against purchasing any so-called vanilla products in Mexico.

It is possible to find real vanilla extract in Mexico, but it will be priced comparably to that in the U.S.; it has to be; natural vanilla is a costly product by dint of its time-consuming production. But, since labels in Mexico are no help and you have no way of knowing what's in the bottle, there is only one sensible rule: If it seems to be a bargain, do your health a favor and don't buy it!

'ake Mine...



WHY PARTICIPATE IN THE NEW VANILLAMARK PROGRAM?

because the VANILLAMARK...

- IS...an opportunity to show your customers that your vanilla product is made with the BEST...100% Bourbon Vanilla.
- IS...a prestigious AWARD from the vanilla industry, given only to a select circle of products.
- IS...a REGISTERED certification mark which is backed by analysis and carefully regulated requirements.
- IS...a COMPETITIVE EDGE for your product as it sits on a shelf filled with "Vanilla Flavored" and "Vanilla, artificially flavored" labels.
- IS...being backed by ADVERTISING in leading national magazines (beginning January, 1987).
- IS...the subject of a massive national PUBLICITY campaign which is romancing Bourbon vanilla...explaining its importance vs. other vanillas and imitations...telling why products made with Bourbon vanilla are superior.
- IS...soon to offer co-op and tie-in opportunities and merchandising aids for Vanillamark licensed products.

...and the bottom line on all this is...

THE VANILLAMARK BUILDS SALES! *

* report sent on request.

Make Mine...



TIPS FOR USING VANILLA BEANS

TO KEEP VANILLA BEANS AT THEIR FRESHEST...

Tightly wrap vanilla beans in foil or plastic wrap and store in the refrigerator or another cool, dark place.

TO MAKE VANILLA SUGAR...

In a covered container mix 2 cups sugar with 1 vanilla bean split lengthwise and cut in 2-inch pieces; set aside for at least 6 weeks.* Stir in more sugar as used. Use in desserts, beverages, over cereal, etc.

TO MAKE VANILLA EXTRACT...

In a covered glass jar place 1 vanilla bean split lengthwise with 3/4 cup vodka or rum; set aside for at least 6 weeks.* Add more liquor as used.

TO USE VANILLA BEANS IN BAKING...

Slice the vanilla bean lengthwise and remove the seeds with the tip of a knife; add the seeds to the fat for good flavor dispersal.

*Flavor intensifies upon standing.

Take Mine...



QUICK TIPS FOR USING PURE VANILLA EXTRACT

In addition to using pure vanilla extract in desserts, try it with these suggestions:

- * Add a generous dash of pure vanilla extract to a cup of coffee, tea or cocoa.
- * Use vanilla with sweet potatoes, yellow squash or carrots.
- * Add a few drops of pure vanilla extract to vinaigrette dressing.
- * To sweeten grapefruit halves, sprinkle with vanilla extract and let sit for 5 minutes.
- * Mix pure vanilla with cut up fresh or cooked fruits.
- * Stir pure vanilla extract into oatmeal or cold cereal.
- * Brush butter mixed with pure vanilla over mild flavored fish, seafood or poultry during broiling.
- * Stir pure vanilla extract into pancake, waffle or dessert crepe batters.
- * Add vanilla extract to fruit glazes for poultry and ham.
- * Add vanilla extract to club soda for a touch of sweetness. It's also delicious in orange juice and lemonade.
- * A teaspoon of pure vanilla makes a difference stirred into eggs for French toast.
- * Mix pure vanilla extract with cream or cottage cheese.
- * Add pure vanilla to corn fritters and cream of corn soup.

Vanilla Spectaculars!

A few of the nearly 100 dramatic, full-page newspaper spreads on real vanilla that have appeared coast-to-coast recently...all direct results of the Univanille public relations program.



so-plain
VANILLA



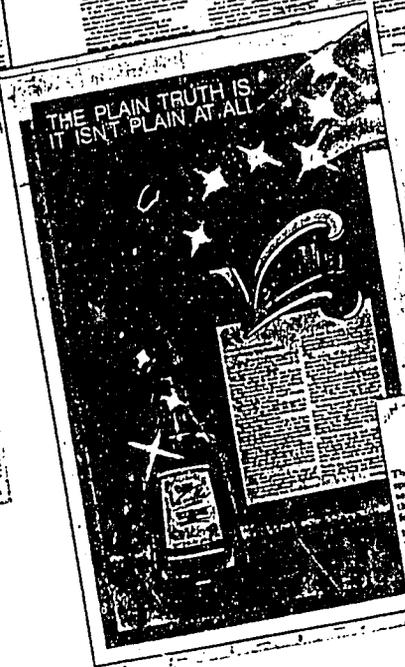
THE COOP ON NILLA



Aromatic beans live life of intrigue



Plain vanilla not as bland as it appears



THE PLAIN TRUTH IS IT ISN'T PLAIN AT ALL



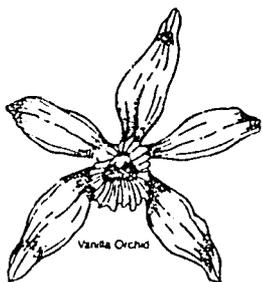
VANILLA



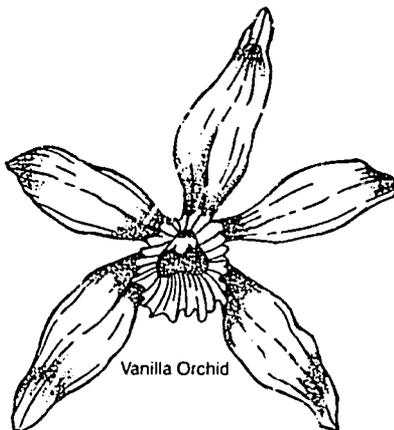
The experts say the best way you can tell the real thing from imitation

BEST AVAILABLE DOCUMENT

BEST AVAILABLE DOCUMENT



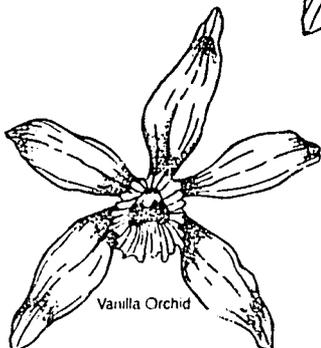
Vanilla Orchid



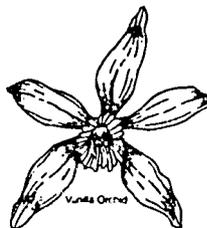
Vanilla Orchid



Bottle of Pure Vanilla Extract



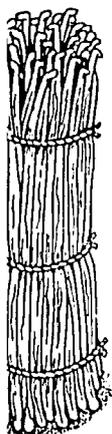
Vanilla Orchid



Vanilla Orchid



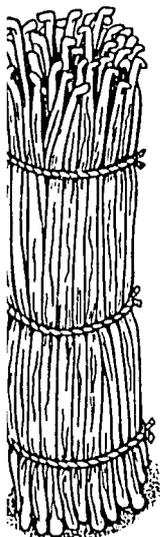
Bottle of Pure Vanilla Extract



Bundle of Vanilla Beans



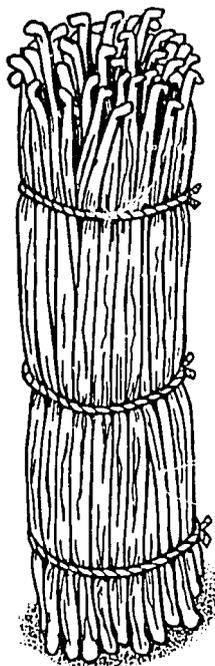
Vanilla Bean



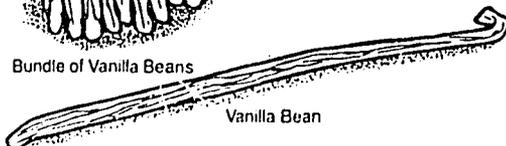
Bundle of Vanilla Beans



Vanilla Bean



Bundle of Vanilla Beans



Vanilla Bean



Bottle of Pure Vanilla Extract

tasti



TROPICAL

tasti

8 Chewy

tasti

tasti

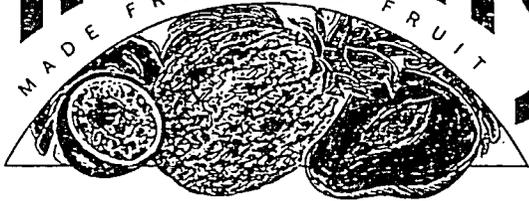
tasti



TASTI GUARANTEE
This product should reach you in perfect condition. If you are not completely satisfied please send packet with details giving date & place of purchase to:
Tasti Products
P.O. Box 45-013,
Te Atatu, Auckland

FRUIT SPLITS

MADE FROM REAL FRUIT



NO ARTIFICIAL COLOURINGS OR FLAVOURINGS

INGREDIENTS:

- Apple,
- Paw paw,
- Apricot,
- Passionfruit,
- Sugar,
- Maltodextrin,
- Pineapple.

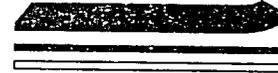
FRUIT SPLITS

MADE FROM REAL FRUIT



TROPICAL

Tasti Chewy Fruit Splits are the exciting new way to enjoy the concentrated goodness of real pineapple, paw paw, passionfruit and apples.
Bursting with more than 3 times their own weight in real fruit, Tasti Fruit Splits are a nutritious, delicious, taste explosion. Ideal for lunchboxes, snacks or as an afterschool treat.



Peel off cardboard backing.

NUTRITIONAL INFORMATION



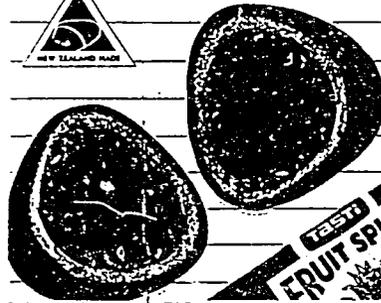
	Per Bar	Per 100g
Energy	254 kJ 61 kcal	1452 kJ 347 kcal
Carbohydrate	15 g	85.5 g
Protein	0.2 g	1.2 g
Fat	0 g	0.1 g
Fibre	1.0 g	5.5 g

NO ARTIFICIAL FLAVOURS OR COLOURS

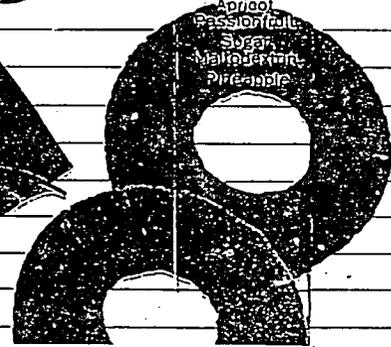
Tasti Products Ltd, Auckland & Christchurch



TROPICAL FRUIT BARS



140g NET.



tasti



TROPICAL



9 403110 045106

OUTSIDE CARTON (PACK); SIZE REDUCED

UNCLE TOBYS

3309

REAL FRUIT
ROLLUPS
LIME TANGO

STORE IN A COOL, DRY PLACE. SINGLE ROLL-UPS NOT FOR INDIVIDUAL SALE.

UNCLE TOBYS



UNCLE TOBYS

UNCLE TOBYS

REAL FRUIT
ROLLUPS
LIME TANGO

REAL FRUIT

REAL FRUIT

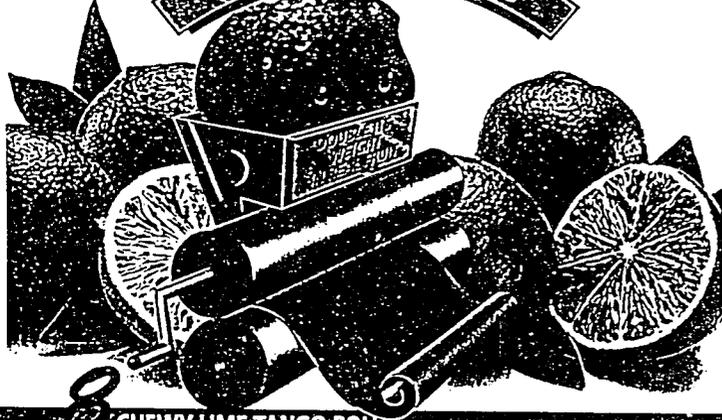
ROLLUPS
LIME TANGO

UNROLLS AND PEELS BEST
WHEN KEPT BELOW 20°C

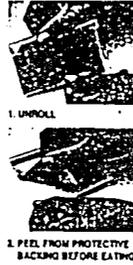
INGREDIENTS
FRUIT —
LIME JUICE, APPLE, PEAR,
PEACH, PINEAPPLE,
MALTODEXTIN, SUGAR,
VEGETABLE OIL,
EMULSIFIER (E471),
FLAVOUR, FOOD
ACID (CITRIC),
COLOUR (TURMERIC, 133)

ROLLUPS

MADE WITH REAL LIMES



CHEWY LIME TANGO ROLLS



1. UNROLL
2. PEEL FROM PROTECTIVE
BACKING BEFORE EATING

DO THE
RIGHT
THING



310060 000058

BLUEBIRD FOODS LIMITED
124 WIRI STATION ROAD MANUKAU CITY AUCKLAND
NEW ZEALAND
MADE IN AUSTRALIA BY
THE UNCLE TOBYS COMPANY LIMITED
BARKLY STREET WAHGHUNYAH 3587 AUSTRALIA

REAL FRUIT
ROLLUPS
LIME TANGO

UNCLE TOBYS

REAL FRUIT

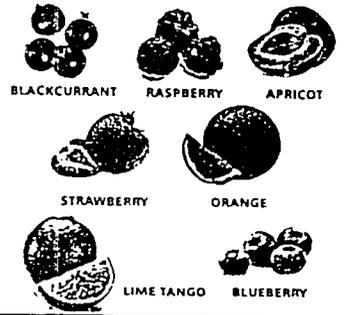
ROLLUPS

MADE WITH REAL LIMES

Uncle Tobys Real Fruit Roll-Ups
are the shareable, tearable, snack that you
unroll, peel and chew, anywhere, anytime.

Real apricots, strawberries, peaches, oranges,
raspberries, blackcurrants, blueberries, limes,
apple, pineapple, plums or pears are used to
make Uncle Tobys Real Fruit Roll-Ups. In fact,
every Uncle Tobys Roll-Up contains more than
TWICE its own weight in real fruit. More than
250g of real fruit was used in making the 125g
of Real Fruit Roll-Ups in this container.
Uncle Tobys Real Fruit Roll-Ups are fun to eat
the fruit taste of Real Fruit Roll-Ups makes
them ideal for lunch boxes, snacks and after
school treats.

TRY ALL THE DELICIOUS VARIETIES
OF UNCLE TOBYS ROLL-UPS:



CUSTOMER GUARANTEE:
If you have any comments or questions about this
product or any other Uncle Tobys product, please
phone our Customer Information Centre
Toll Free 0800 730123

UNCLSID5 CARP0N (PAKC) ; SIZE REDUCED

NO ARTIFICIAL FLAVOURS OR COLOURS
Sugar, Malic Acid, Mannitol, Fructose
Apple, Papaya, Apricot, Passionfruit
INGREDIENTS:



Internal/individual
bar wrapper i.e. printed
" see through " cello-
phane with bar code
allowing unit/piece
sale; product packed
flat with support
liner

TROPICAL

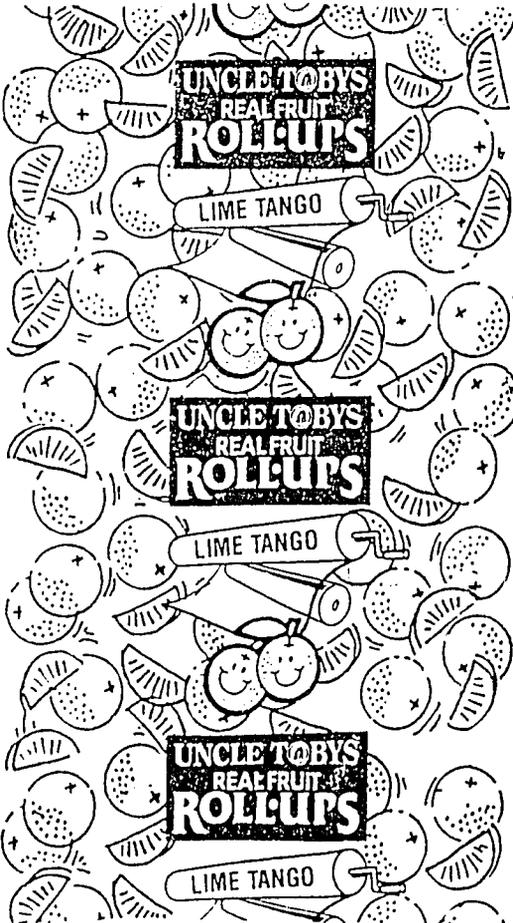
TASTi



41335

TASTi PRODUCTS LTD, AUCKLAND AND CHRISTCH

WHEN KEPT BELOW 20°C. NOT FOR INDIVIDUAL SALE. PEEL FROM PROTECTIVE BACKING BEFORE EATING. UNROLLS & PROTECTIVE BACKING BEFORE EATING. UNROLLS & PEELS BEST WHEN KEPT BELOW 20°C. NOT FOR INDIVIDUAL SALE



WHEN KEPT BELOW 20°C. NOT FOR INDIVIDUAL SALE. PEEL FROM PROTECTIVE BACKING BEFORE EATING. UNROLLS & PROTECTIVE BACKING BEFORE EATING. UNROLLS & PEELS BEST WHEN KEPT BELOW 20°C. NOT FOR INDIVIDUAL SALE

Internal/individual
bar wrapper i.e. printed
paper with internal foil
laminate; product rolled
with plastic separator

New Zealand
Biological Producers
Consumers Council (Inc)

Certified Bio-Gro
Organic Production
Standards



These standards are printed on recycled paper, which greatly reduces the use of energy, wood and water, as well as the resulting pollution of the paper making process. Because no suitable New Zealand recycled paper was available, the New Zealand Biological Producers Council has used Australian recycled paper at a 20% extra cost.

The New Zealand Biological Producers Council is conscious of the economic and energy consumption absurdity of freighting paper from Australia, across the Tasman Sea, to NZ - a paper exporting country.

The New Zealand Biological Producers Council hopes that by the time the next review of the Standards is produced, it will be printed on paper recycled in NZ, from NZ post consumer waste.

**The Bio-Gro logo and symbol are registered
New Zealand Certification Trade Marks.**

Additional copies of these Standards may be purchased from the NZ Biological Producers Council, P.O. Box 36-170, Northcote, Auckland 9, New Zealand. Write for bulk discount rate.

Prices for single copies, postpaid, are:

Within NZ	
Standard post:	\$5.00
Fast post:	\$6.00
All overseas countries	
Surface mail	\$6.00
Airmail....	
South Pacific:	\$6.00
Rest of the world:	\$7.00

Copyright: New Zealand Biological Producers Council, 1991.

Save for fair comment and review, no reproduction of the material in this booklet is permitted in any way whatsoever.

Guide to Contents

Definitions:

- 1.0
- 1.1 Organic agriculture.
- 1.2 Standards.
- 1.3 Council.
- 1.4 IFOAM.
- 1.5 Trade mark.
- 1.6 Licence.
- 1.7 Product / produce.
- 1.8 Production.
- 1.9 Manager / producer.
- 1.10 Certified / Certification.
- 1.11 Bio-Gro.
- 1.12 Transition Bio-Gro.
- 1.13 Conversion period.
- 1.14 Partial certification.
- 1.15 Parallel production.
- 1.16 **Permitted:**
 - 1.16.1 Manure and composts.
 - 1.16.4 Biological activators.
 - 1.16.5 Additives for mineral supplementation.
 - 1.16.6 Pest and disease control.
 - 1.16.7 Cleaning agents.
- 1.17 **Restricted:**
 - 1.17.2 Fertilisers.
 - 1.17.3 Pest & disease control.
 - 1.17.4 Vegetation control.
 - 1.17.5 Animal health remedies.
 - 1.17.6 Cleaning agents.
- 1.18 **Interim animal health remedies:**
 - 1.18.1 Anthelmintics.
 - 1.18.2 Antibiotics.
 - 1.18.3 Pyrethroids
 - 1.18.4 Certification of treated stock.
- 1.19 **Quarantine Area.**
- 1.20 **Prohibited:**
 - 1.20.2 Use of equipment for spraying.
- 2.0 **Location, conversion & quality of land.**
- 2.2 Boundaries and buffer zones.
- 2.3 Conversion to organic agriculture.

3.0 **Residue or contamination levels in produce.**

- 3.2 Heavy metals & other potentially toxic elements.
- 3.3 Brought in feeds for livestock.

4.0 **Livestock production.**

- 4.1 Grazing & housing.
- 4.2 Supplementary feed.
- 4.3 Animal health - requirement to treat.
 - 4.3.2 Specific diseases & remedies.
 - 4.3.3 Internal parasites.
 - 4.3.4 Ectoparasites and flystrike.
 - 4.3.5 Footrot.
 - 4.3.6 Vaccinations.
 - 4.3.7 Docking, dehorning, tailing, mulesing and velveting.
 - 4.3.8 Calf scours.
 - 4.3.9 Mastitis.
 - 4.3.10 Bloat.
 - 4.3.11 Facial excema.
 - 4.3.12 Navel ill.
 - 4.3.13 Induction of parturition.
 - 4.3.14 Metabolic disorders.
 - 4.3.15 Hygiene.
 - 4.3.16 Mineral deficiencies.
 - 4.4 Soil fertility.
 - 4.5 Weed control.
 - 4.6 Stock replacement.
 - 4.7 Grazing.

5.0 **Poultry & egg production.**

- 5.2 Production methods.
- 5.3 Housing.
- 5.4 Feed sources.
- 5.5 Animal health.
- 5.6 Animal mutilations.
- 5.7 Stock replacement policy.
- 5.8 Miscellaneous.
- 5.9 Eggs.
- 5.10 Broiler production.

6.0 **Cropping.**

- 6.1 Rotation.
- 6.2 Soil fertility.
- 6.3 Mineral fertilizers.
- 6.4 Weed control.
- 6.5 Pest and disease control.
- 6.6 Harvesting.
- 6.7 Transport and storage.

7.0 **Vegetable and fruit production.**

- 7.1 Soil fertility.
- 7.2 Off-farm organic material.
- 7.3 Manure management.
- 7.4 Crop rotation.
- 7.5 Mineral nutrition.
- 7.6 Weed control.
- 7.7 Pest and disease control.
- 7.8 Propagation of plant material.
- 7.10 Seeds.
- 7.11 Transport & storage.

8.0 **Inspection & regulation.**

- 8.1 Labelling.
- 8.2 Inspectors.
- 8.3 The property & questionnaire.
- 8.4 The property inspection & report.
- 8.6 Certification & contractual obligations of producers.
- 8.7 Disputes procedures.

9.0 **Progress towards Bio-Gro - flow chart.**

10.0 **Processed food products.**

- 10.1.1 General guidelines.
- 10.2 Where ownership does not change until after processing.
- 10.3 Where ownership changes prior to processing.
- 10.4 Specific guidelines.
 - 10.4.1 Bio-Gro requirements.
 - 10.4.2 Transition Bio-Gro requirements.

11.0 **Packaging guidelines.**

12.0 **Processing dairy products.**

- 12.2 Milk and cream.
- 12.3 Butter.
- 12.4 Yoghurt and other cultured products.
- 12.5 Cheese.
- 12.6 Other dairy produce.

13.0 **Meat processing.**

- 13.1 Transport of livestock.
- 13.2 Slaughter of livestock.
- 13.3 Chemicals.
- 13.4 Carcass marking.
- 13.5 Food additives and preservatives.
- 13.6 Withholding periods.
- 13.7 Sale of meat products.

- 14.0 **Processing grains & other arable produce.**
- 14.1 Storage.
- 14.2 Processing of grains.
- 14.3 Bread & flour products.
- 14.4 Other arable produce.
- 15.0 **Processing vegetable & fruit products.**
- 15.1 Transport & storage.
- 15.2 Fruit & vegetable processing.
- 15.4 Fruit & vegetable juices.
- 15.5 Wine making.
- 15.6 Jams, relishes, chutneys etc.
- 15.7 Spreads.
- 15.8 Other vegetable & fruit products.
- 16.0 **Honey & honey dew production.**
- 16.1 Isolation.
- 16.2 Management.
- 16.2.8 Foundation wax.
- 16.2.9 Sugar feeding.
- 16.3 Extraction.
- 16.4 Residue testing.
- 16.5 Packaging.
- 17.0 **Residue levels in certified systems.**
- 17.2 Chemical residue levels in certified products.
- 17.2.1 Permissible levels of residues.
- 17.3 Permissible levels of heavy metals in manures & composts.
- 18.0 **Interpretation.**

1.0 Definitions:

- 1.1 **Organic agriculture** - which includes such terms as biological husbandry, eco-agriculture, natural, sustainable and bio-dynamic, seeks to produce food of optimum quality and quantity, and to manage productive ecosystems according to a total concept that endeavours to make them sustainable and non-polluting of the environment. Some of the main principles and methods that are employed aim to:
 - 1.1.1 Foster beneficial processes and interactions that are naturally occurring in agro-ecosystems - thus encouraging a farm's internal mechanisms to achieve stability rather than relying heavily on external control measures.
 - 1.1.2 Reduce external control to the absolute minimum required for maintaining the chosen state of production. Inputs used should aim to work as far as possible in conjunction with natural cycles, rather than trying to dominate such cycles.
 - 1.1.3 Achieve cycles/flows of nutrients and materials that have as few losses as possible. This requires the conservation and re-cycling of nutrients and organic material.
 - 1.1.4 Enhance soil fertility - its life supporting ability - including biological, physical and chemical components. Great emphasis is placed on the importance of soil organic matter, and soil organisms (especially soil bacteria and earthworms).
 - 1.1.5 Minimise any deleterious environmental effects of particular management practices.
 - 1.1.6 Therefore, appropriate stocking rates, consideration of animal welfare, sound rotations using diverse stock and cropping strategies with the extensive but rational use of animal manure and other vegetative residues, the use of appropriate cultivation techniques, the avoidance of soluble mineral salt fertilisers, and the prohibition of nearly all chemical pesticides, form the basis of organic agriculture and horticulture.
- 1.2 **Standards.**

Means the Standards for certified **Bio-Gro** organic products of the New Zealand Biological Producers Council (Inc.).

BEST AVAILABLE DOCUMENT

These Standards are subject to constant review, but otherwise remain valid until 31/12/92.

Copyright New Zealand Biological Producers Council (Inc).

- 1.3 Council.**
Means the New Zealand Biological Producers Council (Inc.) and its authorised agents.
- 1.4 IFOAM.**
Means the International Federation of Organic Agricultural Movements.
- 1.5 Trade mark.**
Means as the case may be either NZ certification trade mark Bio-Gro logo and/or NZ certification trademark Bio-Gro.
- 1.6 Licence.**
Means the certificate in the form of an annual licence granted by the Council to the manager or producer to use the Council's trade mark.
- 1.7 Product / produce.**
Means any item or activity of any kind which may qualify for a license to use the Council's trade mark.
- 1.8 Production.**
Means the creation of any item or the result of any activity which is or may be intended to be a product licensed to carry the Council's trade mark.
- 1.9 Manager / producer.**
Means the person in charge (whether owner, manager, shareholder, etc.), of a certified activity of any kind which may qualify for a license to use the Council's trade mark, who shall:
- 1.9.1 have control of the day-to-day operations certified by the Council
- 1.9.2 have been present at the inspection
- 1.9.3 sign the application and property questionnaire
- 1.9.4 sign the annual licence, any contract and statutory declaration.
- 1.10 Certified / Certification.**
Means any property or product that meets the Standard set by any independent certifying organisation in New Zealand or overseas that has been evaluated and accredited by IFOAM and is recognised by the Council. Uncertified shall have the contrary meaning.

- BIO-GRO.**
Means a property or product of that property either whole or processed that has met the requirements of these Standards (over a minimum period of 24 months in the case of the property) and has satisfied the Council's requirements for inspection and verification and has been issued with a licence to use the Council's Bio-Gro trade mark.
- 1.12 Transition Bio-Gro.**
Means a property or product of that property either whole or processed, that has completed the conversion period as defined in these Standards, has satisfied the Council's requirements for inspection and verification and is working towards meeting the full requirements of these Standards and has been issued with a licence to use the Council's transition Bio-Gro trade mark.
- 1.13 Conversion period.**
Means a period (usually 12 months) before any initial certification is issued by the Council during which no prohibited materials or activities have occurred on the part of the property moving towards certification. This period is measured back from the date of planting of crops, bud burst of fruit, or parturition in animals. This conversion period may be individually varied at the Council's discretion.
- 1.14 Partial certification.**
1.14.1 Means a designated portion of the property that may be awarded certification, when considered appropriate as a means of facilitating and encouraging the conversion of an entire property to certified status. A condition of this will be the implementation of an agreed plan to convert the entire property to certified status within a set period.
- 1.14.2 Full Bio-Gro certification may not be granted in certain circumstances to a partially certified property where prohibited practices and materials have not been eliminated from the property, particularly where the requirements of section 1.15 and section 2.2 are not complied with.

1.15 **Parallel production.**

Means growing, processing or production on the one property, within the same period, of the same kind of produce that is **not clearly different by type, breed or cultivar characteristics**. Unless a departure has been authorised in writing by the Council, such parallel production is prohibited. Special conditions apply to parallel processing. (See section 10).

1.16 **Permitted:**

Means materials or practices within the guidelines of these Standards that are acceptable for use in any certified production or property. When available certified materials should be used.

1.16.1 **Manure and composts** - cycled internally. Manures both solid and liquid, composts and plant material produced on the property.

1.16.2 **Manures, compostable and mulching materials** brought in from uncertified sources. Manures both solid and liquid, and plant and other organic material for use as mulches can be brought onto a certified property providing that:

1.16.2.1 All materials with the exception of mulches have gone through an acceptable hot composting process before use.

1.16.2.2 Every effort has been made to ensure that material is free from contamination from prohibited materials. Particular attention should be paid to heavy metal contamination.

1.16.2.3 That mulching materials which come from an acceptable source are documented as free from all prohibited materials.

1.16.2.4 **Manures and mulching materials** from factory type animal production may be excluded in the future. A review of the Council's Standards occurs every two years under existing international regulations.

1.16.4 **Biological activators.**

Bio-dynamic preparations.
Microbial activators.
Various plant based preparations.

1.10.3 **Activates for mineral supplementation**

(heavy metal analysis may be required).

Elemental sulphur. *Calcium sulphate* (gypsum)
Feldspar Glauconite (greensands).
Limestones Dolomite (Magnesium limestone).
Rock phosphate Rock minerals.
Unadulterated seaweed and fish products.
Unrefined unadulterated rock or sea salt

1.16.6 **Pest & disease control.**

Waterglass (*Sodium silicate*).
Herbal sprays Homoeopathic preparations.
Natural purgatives Soft soaps
Sulphur burning Thermal sterilisation
Pheromones but not directly on plants.
Biological controls (parasites, predators or disease organisms).
Gas saturation using *nitrogen* or *carbon dioxide*.
Mechanical controls (traps, barriers, sound scares, lures).

1.16.7 **Cleaning agents.**

Thermal sterilisation.
Hydrogen peroxide. Soft & hard soaps.

1.17 **Restricted:**

1.17.1 Materials which may be used but only in accordance with the principles laid down in these Standards. This shall lead to a gradual reduction in dependence on such materials. These materials may be used only until such time as more acceptable alternatives are available and only after consultation with an appropriate advisor.

1.17.2 **Fertilisers.**

Basic slag *Magnesium oxide*.
*Potassium sulphate** Trace elements.
*The use of *Potassium sulphate* may preclude full Bio-Gro certification.

1.17.3 **Pest & disease control.**

Diatomaceous earth. Sulphur preparations.
Lime sulphur. *Potassium permanganate*.
Copper hydroxide. Bordeaux, Burgundy.
Mineral oils Quassia.
Rotenone (derris). Ryania.

Metaldehyde - in closed containers only.

Rodenticides - in closed containers only - *brodifacoum*, *bromadiolone*, *warfarin*, *maldison*.

Pyrethrum, pure and in combination with the synergist, *Piperonylbutoxide*.

1.17.4 Vegetation control.

Thermal techniques.

Herbicides derived from fatty acids. Other herbicides may be allowed for the establishment of fully enclosed shelter belts/woodlots on Transition properties provided they are applied by knapsack as a spot spray.

1.17.5 Animal health remedies.

Mineral supplements.

Vaccines.

Zinc oxide and sulphate.

Copper sulphate.

Iodine preparations.

Sulphanilamide as spot treatment for external use only.

1.17.6 Cleaning agents

Caustic soda.

1.18 **Interim animal health remedies.** The following restricted interim animal health remedies may be used subject to section 4.3. **Withholding periods are three times the label recommendation (or minimum of 48 hours [2 days]). Always check the product label and apply the appropriate quarantine procedures.**

1.18.1 **All stock so treated and their products lose certification for 12 months from the last treatment.**

1.18.2 **Internal parasiticides:** *Levamisole* based drenches will have quarantine periods from the minimum 2 day requirement, up to 21 days, depending on formulation. *Morantel citrate* and *tartrate* based drenches will have quarantine periods from the minimum 2 day requirement, up to 3 days, depending on formulation.

1.18.3 **Antibiotics:** Records must be kept of any such administration.

1.18.4 **External parasiticides:** *Cyromazine* quarantine periods range from 21 to 63 days, depending on formulation. *Cypermethrin* withholding period 21 days. *Deltamethrin* withholding period 9 days. *Cis-cypermethrin* withholding period 2 days. Synthetic pyrethroid - *Flumethrin* - quarantine period 2 days. Synthetic *ciano-pyrethroids* quarantine period 2 days.

Withholding periods are three times the label recommendation (or minimum of 48 hours (2 days)). Always check the product label and apply the appropriate quarantine procedures. Treatment with any other prohibited materials is not permitted except where prior written consent has been received from the Council.

1.19 Quarantine area

1.19.1 This is a designated area of the property where **replacement and brought in livestock and livestock treated under the interim animal health remedies regulation can be run for the duration of the required withholding period.** The quarantine area should be clearly designated in the farm plan.

1.19.2 **The quarantine area** is not to be used for the grazing of certified stock or the production of crops for twelve months following the last use as a quarantine area. It is in the interests of the producer to use those materials having the shortest possible withholding periods. This will ensure the smallest possible area designated as a quarantine area.

1.20 Prohibited:

1.20.1 Except as otherwise provided in these Standards, all other materials are prohibited from use on/in certified properties/products unless agreed to in writing by the Council. Except as so agreed by the Council, their use will cancel an existing Bio-Gro certification and the property may be required to go through at least a 12 month conversion period before certification is regained. No prohibited materials may be **stored** on a Bio-Gro certified property.

1.20.2 **Use of equipment for spraying.** The use of any equipment for spraying, no matter who ownership of such equipment is vested in, is not allowed on certified areas/properties if prohibited materials have been used in the equipment. Particular conditions apply where transition or partial certification exists.

2.0 Location & land conversion.

2.1 **Location and quality of land.** A farm plan of the entire property must be supplied to the satisfaction of the Council with the initial application for certification. The land to be certified must be clearly shown on this plan.

- 2.2 **Boundaries and buffer zones.** The boundaries of the land to be certified must be clearly defined in the plan by permanent structures such as roads, fences, hedges, streams, shelter belts, etc.
- 2.3 **Conversion to organic agriculture.** Conversion of a property from conventional to certified production must meet the requirements of these Standards. This will usually require attention to:
- 2.3.1 The productive capacity of the land.
- 2.3.2 Diversity of the cropping and pastoral aspects of the property.
- 2.3.3 Herbage composition, with a view to incorporating a greater range of grasses, legumes and herbs.
- 2.3.4 Cropping rotations that balance fertility building and exploitive phases.
- 2.3.5 Grazing systems that seek to control animal parasites, as well as achieve effective utilisation of fodder and management of the pastures.
- 2.3.6 Appropriate manure and fertiliser input strategies.
- 2.3.7 General environmental enhancement that reduces livestock and crop stress (weather and pest) by the provision of living shelter for shade, wind protection, and parasite/predator habitat, etc.
- 2.3.8 The conversion will be monitored annually by the Council.
- 3.0 **Residue or contamination levels** in produce from a property in conversion may require analysis to determine their acceptability to the Council. This requirement shall be at the Council's sole discretion, and shall be at the cost of the producer. The Council may also require the results of such analyses to be declared to purchasers of such produce.
- 3.1 Residue levels in excess of those acceptable to the Council, as determined by the best currently available knowledge and techniques for minimum detectable levels may well preclude certification. (See section 17.0).
- 3.1.2 The presence of certain residues on certified properties and in products that results from unavoidable background contamination, may not preclude that property or product from certification. No mandatory testing for residues is presently required. (See section 17.0).
- 3.2 **Heavy metals & other potentially toxic elements** can be essential to plants and animals in trace amounts, eg. zinc, selenium and copper, but be

toxic at higher concentrations or may be inherently toxic, eg. cadmium, mercury and lead. An essential trace element deficiency may be corrected by the application of Council approved materials at specified amounts. Every effort must be made not to add to existing levels of toxic heavy metals.

- 3.3 **Brought in feeds for livestock.** Every care should be taken to ensure that brought in feeds from uncertified sources, to the extent allowed in these Standards, are acceptable. (See section 4.2). Documentation should be sought from suppliers declaring that prohibited materials have not been used on brought-in feeds.
- 4.0 **Livestock** production methods may be associated with pastoral or mixed cropping systems. Whatever the system employed, the following methods will apply:
- 4.1 **Grazing and Housing.** All stock shall be managed with respect to their welfare. Animals grazed off the property must be grazed on certified pastures. Factory farming methods of intensive livestock rearing in enclosures are prohibited.
- 4.2 **Supplementary feed** from certified sources is allowed. In the absence of certified supplementary feeds and subject to written notice to the Council, feed from uncertified sources is permitted up to a maximum of 15% of the total annual dry matter intake of the animal. (This percentage may be reviewed as sources of certified feed increase). Caution should be exercised in buying in feeds from uncertified sources. No commercial feeds shall contain prohibited materials. Mineral licks are permitted. (All of this section is subject to section 2.3).
- 4.2.1 Young animals, including calves, must receive colostrum, for a minimum of five days after birth. If they are to be retained in the herd, they must receive natural milk until weaning.
- 4.3 **Animal health.**
- 4.3.1 **Requirement to treat.** Producers of meat and dairy products shall market only healthy animals and their products and shall never allow a diseased or severely infected animal to go untreated in order that it may be classed as certified.

- 4.3.1.1 Any animal treated with a material in section 1.18 shall lose certified status for 12 months from the last treatment. A quarantine area shall be used to hold such treated stock. After the appropriate withholding period any stock so treated may be returned to the main flock or herd **provided they are clearly and permanently marked**. Routine or scheduled use of any materials listed in section 1.18 is prohibited.
- 4.3.2 **Specific diseases & remedies.** In cases where specific diseases or health problems are known to occur control measures may be used subject to the Council's written approval.
- 4.3.3 **Internal parasite elimination.** by breeding resistant animals, using grazing management and non-chemical procedures is an objective of organic agriculture (See section 2.3). The level of worm inoculum present in pastures must be reduced or eliminated by cropping, cross-grazing, rotations, or browse fodder. Natural purgatives and homoeopathic remedies are permitted. Stock carrying an unacceptable worm burden may be treated under section 1.18.
- 4.3.4 **Ectoparasites & flystrike.** Dipping for lice and other ectoparasites may be carried out only if the welfare of the animal is under threat. Where control is necessary see sections 1.18 & 4.3. **Routine or scheduled use of dips is prohibited.**
- 4.3.5 **Footrot.** *Zinc or copper sulphate* treatment.
- 4.3.6 **Vaccinations.** Breeding to obtain stock with high levels of natural immunity must be an objective. In the event of an outbreak, vaccines which stimulate the animals natural immune system, and are prepared from naturally occurring organisms, may be used. Routine or scheduled vaccination is prohibited unless evidence satisfactory to the Council is produced showing that the infection is inherent in the property.
- 4.3.7 **Docking, dehorning, tailing, mulesing and velveting.**
- 4.3.7.1 Detailing of pigs and cattle is prohibited. Dehorning of cattle may only be done at the bud stage or by a veterinary surgeon under anaesthetic. An animal which has been anaesthetised for dehorning will lose its certification for 12 months.
- 4.3.7.2 Mulesing of merino type sheep may be permitted where need can be demonstrated and only after written approval by the Council. Breeding towards wrinkle-free sheep must be an objective.
- 4.3.7.3 **Deer** may have their velvet removed by a veterinary surgeon or other qualified person under an anaesthetic or by other techniques only after written agreement by the Council. An animal to which a drug has been administered to facilitate velveting must be quarantined and will lose certification for 12 months.
- 4.3.8 **Calf Scours.** Oral rehydration with glucose electrolyte solution is allowed. Infected animals are to be isolated from the herd until cured. Homoeopathic, chalk and fine clay remedies are permitted.
- 4.3.9 **Mastitis.** Use of homoeopathic and naturopathic remedies is permitted. All antibiotics are prohibited from use on any certified stock. Drying-off mildly infected quarters is permitted.
- 4.3.10 **Bloat.** Vegetable oils, and paraffin may be used. Routine use is not permitted.
- 4.3.11 **Facial excema.** *Zinc or copper sulphate* may be used in cases of need. Routine use is not permitted.
- 4.3.12 **Navel ill.** Where it is likely to occur, iodine may be used to prevent infection.
- 4.3.13 **Induction of parturition.** Natural prostaglandins may be used only when essential for veterinary reasons.
- 4.3.14 **Metabolic disorders.** Magnesium salt may be used to treat grass staggers. *Calcium boroglutamate* or natural Vitamin D may be used to treat milk fever. Routine or scheduled administration is not permitted.
- 4.3.15 **Hygiene.** Subject always to the Council's written approval, standard MAF recommendations for dairy shed hygiene should be followed.
- 4.3.16 **Mineral deficiencies** that persist after conversion to certified status, and trace elements may be corrected by application to pastures as natural mineral fertilisers, rock dusts, or sea products of either fish and/or seaweed combinations. Multiple pasture species should be planted, especially those plants known to accumulate the deficient element. To prevent stock ill-health, mineral supplements may be directly administered. Routine use of such supplements is discouraged in certified properties. Where possible such deficiencies should be corrected by soil amendments so that the animals' intake is in a natural (plant) form.

- 4.4 **Soil fertility, structure, and organic matter** return should be maintained by maximum nutrient cycling, accumulation of organic matter and increased biological activity. Permanent pastures which rely on nitrogen fixation by legumes, and are used for all year grazing can fulfil these requirements. (See section 2.3).
- 4.4.1 However, as the commercial farm situation is one of net export of nutrients in the product, replacement of nutrients from external sources may be required. Subject always to the provisions of these Standards, the timing and method of fertiliser use should be determined according to soil type, stock type and climate. (See sections 1.16, 1.17).
- 4.4.2 Livestock can be reared as part of a mixed cropping rotation which includes grazed pasture. This system more adequately meets the definition of organic agriculture in Section 1.1.
- 4.5 **Weed Control.** Weeds must be controlled by cross grazing management and by maintaining a vigorous sward. Mowing, before seeding for thistles, or pulling at early flowering for ragwort is suggested to prevent reinfestation of the farm and neighbouring properties. In systems where livestock is part of a rotation then management of the rotation as a whole becomes the main weed control method.
- 4.6 **Stock replacement policy.** Although it is desirable to replace capital stock by breeding replacement stock on the farm, animals bought in should be certified whenever possible. When certified breeding stock are unavailable, purchases must be quarantined on arrival. (See sections 1.19, 4.6.1, 4.6.2).
- 4.6.1 Producers must determine what animal health remedies and feeds have been used during the three months prior to purchase. If any prohibited materials have been administered, prior written approval shall be obtained from the Council which shall determine the certification of such stock.
- 4.6.2 In the case of stock bought in from uncertified sources, a full year must elapse before any meat, fibre, milk or other product from those animals, or the animals themselves, may be certified. Provided progeny is conceived on the certified property such progeny will be regarded as certified.
- 4.7 **Grazing** may be sold to pasture certified stock. If the stock are uncertified, see section 1.19 and 4.6.2. Such cases must be clearly documented to the Council, listing all prohibited substances administered in the previous three months.

Poultry & egg production.

- 5.0 These Standards apply to chickens. Those for turkeys, ducks, geese and other poultry will be assessed on the same principles as those for chickens, making appropriate alterations to specific requirements.
- 5.2 **Production methods.** For reasons of animal welfare and disease prevention only a free-range system can be considered as sustainable organic poultry husbandry.
- 5.3 **Housing.** All stock are to be managed with respect for their welfare and adequate room allowed to permit the birds to perform their inherent behaviour patterns. If full time access to well sheltered free range is allowed, the houses can be smaller than if housing provides the only shelter from inclement weather.
- 5.3.1 If birds are regularly confined to their housing then part of the floor area must be covered in deep litter. Adequate perching space and nesting boxes must be provided.
- 5.3.2 Disinfection of housing should preferably be done between batches and only with permitted materials. When natural daylight is prolonged by artificial lighting it must not lead to a total daylight period of more than 15 hours and must be started and ended by a dimming period. (Fluorescent lights are not permitted).
- 5.3.3 **Outside runs** must provide access to fresh grass or forage crop which should contain a diversity of species. If the run area is limited, access to fresh pasture must be provided by a controlled rotation with either fixed or movable fences and/or movable housing.
- 5.3.4 Runs must provide adequate natural shelter and provision for dust bathing. Access to outside runs must be provided by the age of 3 weeks for meat chickens and 6 weeks for laying pullets.
- 5.4 **Feeding** with uncertified materials must not exceed 15%. Any written exemption from this requirement by the Council may preclude full Bio-Gro. Ample and continuous access to fresh water must be provided. Green feed is to be available all year round with supplementary green feed to be used if pasture production is inadequate. Naturally occurring minerals and vitamins can be used. Synthetic vitamins can be used only in laying stock up to 10 weeks of age.

- 5.5 **Optimum animal health** depends on good management and proper hygiene. Growth regulators, hormone stimulants, antibiotics and coccidiostats are not permitted.
- 5.6 Animal mutilations such as debeaking, toe cutting, wing burning and the fitting of spectacles are not permitted. Marek's vaccination is permitted for laying birds. Vaccination of broiler chickens is only allowed with the prior written approval of the Council. Sick or parasite infested birds should be isolated and treated with permitted materials. Stock requiring conventional medication should be treated, quarantined and diverted to conventional markets or culled.
- 5.7 **Stock replacement policy.** Day old chicks (layer and meat) can be bought in from any source. Laying stock must be reared on the property or be certified. With prior written approval from the Council laying pullets may be purchased up to 8 weeks of age from conventional producers. Such stock and their products can only receive transition certification.
- 5.8 **Miscellaneous.** It is recommended to keep one rooster with every 50/100 laying hens. Producers with more than 100 laying hens or an annual production of more than 100 broilers are required to keep an inventory of stock, feed sources and medication administered.
- 5.9 **Eggs** should be collected regularly, stored in a cool (below 15 degrees centigrade), dark, dry and odour-free area (with the pointed end facing downwards). Eggs should be free of manure and clean. Eggs are to be packed in recycled paper cartons (neutral grey), or reused containers. Cartons must be clearly identifiable at the point of sale with the name and address of producer to prevent any confusion with uncertified free range eggs.
- 5.10 **Broiler production.** It is strongly recommended to rear broiler chickens with movable housing only. The high feed intake and subsequent large amounts of droppings, means a high priority must be given to constant shifting to fresh pastures to prevent disease build up - mainly coccidiosis. (See section 5.1).
- 6.0 **Cropping** production methods that allow the integration of grazed pasture and the growing of crops provide for many beneficial interactions in an organic agriculture system.

- 6.1 **Rotation** is important to successful organic agriculture. Grazed pasture from a well composed ley builds a well structured and nitrogen rich soil and helps mobilise soil nutrients for the following crops.
- 6.2 **Soil fertility maintenance,** soil organic matter and soil structure are of paramount importance. When correctly managed, pasture can aid in building up soil organic matter and improving soil structure. The use of green cover crops during winter, the practice of mulching straw, growing multi-species pastures, optimal utilisation of pasture and avoiding soil compaction all aid in maintaining soil fertility.
- 6.3 **Mineral fertilizers** should be regarded as a supplement to, and not a substitute for, nutrients cycled via organic matter return. (See sections 1.16.5, 1.16.1).
- 6.4 **Weed control** depends on timely management techniques which include rotation, and the use of mechanical, hand or thermal means. Mulches may be used for weed control. Organic mulches must be from an approved source (See section 1.16.1). Plastic may be used but must be retrieved after use. Biodegradable mulches may be used.
- 6.5 **Pest and disease control** in organic agriculture depends on building an environment based on good husbandry practices that prevent a build up of pest and disease problems. Routine problems indicate a failure to identify the main cause. (See sections 1.16.6, 1.17.3, 1.17.4). Equipment used for spraying must not be used for prohibited substances. (See 1.20.2).
- 6.6 **Harvesting.** Machinery used for harvesting certified crops should ideally be used only on such crops. If it is used for harvesting conventional crops, it must be thoroughly cleaned, so there is no danger of contaminating certified produce, nor bringing weeds or pests onto the property. (See 1.20.2).
- 6.7 **Transport and storage** containers for certified produce should be thoroughly cleaned before use. Certified produce should be stored in containers used solely for that purpose. Natural pyrethrum can be used in buildings but must not be applied directly to the grain. Rodenticides must only be used outside storage containers.
- 6.8 **Prohibited materials** coming into contact with either the harvested crop or when in storage will void certification.

- 7.0 **Vegetable and fruit** production methods are intensive and will likely involve the incorporation of organic materials from outside the property. Rotations usually exclude grazed pasture and livestock.
- 7.1 **Soil fertility** particularly requires that sufficient quantities of organic material be returned to the soil to maintain its organic matter. Depending on the net output of produce and the cropping intensity, organic material produced on the property is rarely sufficient to maintain soil organic matter levels and/or acceptable soil nutrient levels. This means considerable quantities of organic material will be brought in.
- 7.2 **Off-farm organic material** brought in must comply with these Standards (See section 1.16.2).
- 7.3 **Manure management.** Due to extensive production of composts and use of manures, care must be taken to avoid leaching of nutrients with consequent environmental pollution. The use of uncertified raw manures is restricted. The Council may introduce limitations on the tonnage of manurial applications to reduce the risk of environmental pollution and unacceptable nitrate contamination of water courses and foodstuffs.
- 7.4 **Crop rotation** which includes a diverse range of crops is fundamental to successful intensive organic cropping and should receive careful attention. The use of minimal tillage and extensive use of green crops between main crops is also considered an important part of good rotational practice.
- 7.5 **Mineral nutrition.** On intensive vegetable production units using adequate organic additions, further mineral enrichment is unlikely. Less intensive vegetable units and in particular orchards, may require to supplement organic inputs with some mineral additions. (See sections 1.16.5, 1.17.2).
- 7.6 **Weed control** depends on timely management techniques which include rotation and the use of mechanical, hand or thermal means. Mulches may be used for weed control; organic mulches must be from an approved source (See section 1.16.2). Plastic and bio-degradable mulches may be used but plastic must be completely removed from fields after harvest.
- 7.7 **Pest and disease control.** Equipment used for spraying must not be used for prohibited substances. (See section 1.20.2). The main aim of certified

production is to build an environment that prevents the build up of pest and disease problems (See section 2.3). Routine problems indicate a failure to identify the main cause resulting in the need to use other control measures. (See sections 1.16.6, 1.17.3, 1.17.4).

- 7.8 **Propagation of plant material** for annual production. Buying in plant material from uncertified sources is restricted. Departures from this regulation may be permitted by prior written approval of the Council.
- 7.9 Vegetable producers are expected to ensure that all propagated material is grown in media free of prohibited materials. Such plant material must also be raised in an environment free of prohibited materials. Departures from this requirement may be permitted by prior written approval of the Council.
- 7.10 **Seeds treated with any prohibited material** should be avoided in favour of untreated seeds.
- 7.11 **Transport & storage.** Fruit and vegetables may only be treated, stored or packed using the methods listed below.
- 7.11.1 **Recommended.**
 Pure ice Dry ice.
 Refrigeration Controlled atmosphere.
- 7.11.2 **Prohibited.**
 All prohibited fumigants,
- 7.13 **Fresh fruit & vegetables.** During sorting, washing and grading etc., certified products should not come into contact with, or be confused with, uncertified goods. Prohibited materials must not be used while preparing produce for sale. The visual enhancement of produce for sale, e.g. waxing of fruit, may be carried out with materials and processes that have the prior written approval of the Council.
- 8.0 **Inspection & regulation** of all certified properties and/or processing facilities are carried out by the Council.
- 8.1 **All labelling on produce** must carry the registered number, and name and address of the producer, to safeguard the consumer and the producer.

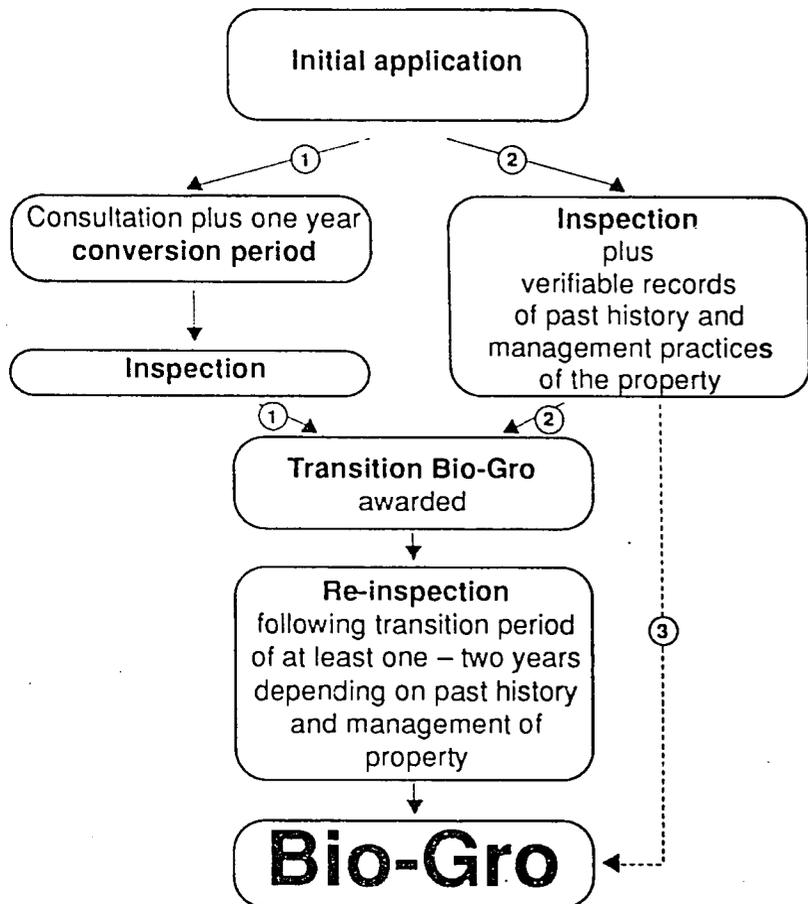
Provided all fees and ancillary requirements have been met, the producer and/or packaging shall also be licensed to carry the Bio-Gro trade mark. The licence will be issued jointly to a **product (or products), a property or processing facility, and the manager**. Additional products may be added to the licence at the Council's discretion. If either the manager or property/processing facility changes, the licence to use the trade mark lapses immediately.

- 8.2 **Inspectors** shall usually hold a relevant tertiary qualification in some aspect of environmental or biological science and/or experience in some aspect of primary production. They will need to satisfy the Council that they are familiar with its Standards, and have a demonstrable interest in the philosophy of organic agriculture. Each new inspector will be required to attend a training course, and meet the requirements of the Council.
- 8.3 **The property & questionnaire.** The inspection will be governed by the description of the business and business practises, provided by the applicant. The manager will be required to provide details of the farming operation, including livestock, mixed cropping and livestock, horticulture - vegetable and fruit crops, and a farm plan, drawn to scale and showing:
- 8.3.1 All paddocks fully named or numbered for easy reference.
 - 8.3.2 The nature of all internal boundaries e.g. hedge, tree line, shelter belt, fencing (closed or open), stone walls.
 - 8.3.3 The nature and condition of the external boundary.
 - 8.3.4 The presence and composition of woodlot plantings or natural areas.
 - 8.3.5 Major soil types within the property.
 - 8.3.6 Natural drainage patterns.
 - 8.3.7 Reference will be made to areas adjacent to the property being inspected for possible sources of pollution, particularly:
 - 8.3.8.1 Fruit orchards - potential spray drift danger.
 - 8.3.8.2 Hill and riverbed country liable to aerial spraying of herbicides and consequent spray drift and polluted water run-off.
 - 8.3.8.3 Major roads - potential pollution of adjacent production areas.
 - 8.3.8.4 Polluting industry - aerial drift and water contamination.
 - 8.3.8.5 Polluted water as an irrigation source.

- 8.3.13 Records of the production methods used on the property in the past will also be required, including:
 - 8.3.13.1 Past use of organochlorines.
 - 8.3.13.2 Weed control techniques.
 - 8.3.13.3 Soil fertility maintenance.
 - 8.3.13.4 Rotation cycles & crop details.
 - 8.3.13.5 Pest and disease control.
 - 8.3.13.6 Harvest procedures.
 - 8.3.13.7 Storage facilities.
 - 8.3.13.8 Supplementary feeding.
 - 8.3.13.9 Livestock management with details of stock held.
 - 8.3.13.10 Records of administration of veterinary medicine.
- 8.4 **The property inspection & report** is to ensure that the requirements of the Council's Standards are being met and that the manager is familiar with them. Producers will have been supplied with a set of Standards when they obtained membership. When the appropriate questionnaires are completed and returned, and the fees paid, the Council shall appoint an inspector to visit the property, together with such other representatives as the Council may decide. The certification decision of the Council will be based on the farm details and history supplied by the applicant, together with the inspection report.
- 8.5 The information contained in the property questionnaire will be clarified and verified as it relates to the Standards. In addition an inspection tour of the farm is carried out to examine the production system and to establish the status of the property under inspection. Depending on the outcome of the inspection, the Council may require certain analytical tests on soil, plant or product. Any such tests required will be at the expense of the applicant. Before application, it may be appropriate for the applicant to seek advice from relevant sources.
- 8.6 **Certification & contractual obligations of producers.** The manager signs the questionnaire as guarantor that the information is correct, and that production will continue according to the Standards and to inform the Council, verbally and in writing, if any changes occur that affect the accuracy of the information in the farm questionnaire or any other information given to the Council.

- 8.7 Disputes procedures for dealing with breaches of Bio-Gro licences from the New Zealand Biological Producers Council.
- 8.7.1 Any breach of a Bio-Gro Licence by any licensee will be sufficient cause to have the licence suspended, including the suspension from sale of any certified produce provided the Council considers that the allegation is from a reliable source. Should such a breach relate to residues of prohibited materials in certified produce, such residue levels shall be those which generally indicate direct application rather than indirect or ambient contamination beyond the licensee's control.
- 8.7.2 When this situation arises the President, a vice President or in their absence any other officer or any two Executive Committee members after consulting the appropriate licensee and inspector by telephone where possible may authorise immediate suspension of a Bio-Gro licence.
- 8.7.3 When such action is taken a fast post, registered letter will be sent at the earliest opportunity to the suspended licensee containing the following information:
- 8.7.3.1 Confirmation of the suspension and naming the person who authorised the suspension.
- 8.7.3.2 An explanation why such action was taken stating that an appropriate documentary explanation supplied to the Council could result in the reinstatement of the licence, but that in the meantime the credibility of the Bio-Gro trade mark and Standards will be safeguarded by the suspension.
- 8.7.3.3 A request for an explanation and detailed information regarding all the persons/outlets supplied with any Bio-Gro product or produce by the suspended licensee, the volume of production and current stocks held by the suspended licensee.
- 8.7.3.4 That all persons/outlets be notified immediately by the suspended licensee at the licensee's costs telling them that the Bio-Gro licence has been suspended.
- 8.7.3.5 A statement that the suspension will be discussed at the next Council Executive Committee meeting giving the date of such meeting where possible at which time the future of the licence may be determined.
- 8.7.4 That investigations be carried out to determine the possible cause of any breach of the licence or Standards.

- 8.7.5 That the suspension be removed by the Council at the earliest possible time if no contravention of the licence or Standards is found to have occurred. If there has been a breach, then the Council or its Executive Committee may in its absolute discretion impose a penalty on the licensee suspended or otherwise.
- 8.7.6 That in no way shall the Council have any liability whatsoever for any losses or expenses incurred relating to the suspension of any Bio-Gro licences. However the Council shall have an obligation to determine the validity or otherwise of the allegation as quickly as possible with no reasonable expense spared to do so.
- 8.7.7 A full report shall be provided to the next Executive Committee meeting following the suspension by the person authorising the suspension.
- 8.7.8 The only person authorised to speak publicly regarding the issue involved will be the person authorising the licence suspension and/or the Council's Public Relations Officer.



These Standards are subject to constant review, but otherwise remain valid until 31/12/92.
 Copyright New Zealand Biological Producers Council (Inc).

- 10.1 The Council's Standards are based on those of IFOAM. Within these Standards, the guidelines for processed foods are also based on the provisional IFOAM guidelines. As the details of these guidelines have not been finalised section 10 is a preliminary guide for certified processed food products.
- 10.1.1 **General guidelines for all processed food products:** The vital quality of certified products must be maintained during processing and trading. The methods used must adequately conserve the composition of the raw materials so that maximum nutritional value remains in the final product. The least raw material transformation should be the goal.
- 10.1.2 The processing should be environmentally sound with respect to energy use, and to waste volume and pollution. As far as is possible products should be packaged in environmentally friendly materials. All processed products need to be clearly labelled with the ingredients and their respective percentages in the product, so that the purchasers can easily determine the composition of the product.
- 10.2 **Where ownership does not change until after processing.** All certified products that are processed off farm must be processed in facilities that have been inspected and approved by the Council. Where parallel production occurs, special attention will be directed to record keeping and the safeguards employed to ensure the fidelity of certified produce. An additional fee may be charged for any such inspection.
- 10.3 **Where ownership changes prior to processing.** Such facilities are required to be separately registered and inspected by the Council. Inspection of processing facilities will involve aspects of general hygiene, cleansing of the plant and pest control to ensure all processes and materials used meet the requirements of these Standards. Where parallel production occurs, special attention will be directed to record keeping and the safeguards employed to ensure the fidelity of certified produce.
- 10.4 **Specific guidelines for processed food.**
- 10.4.1 **To qualify for Bio-Gro certification the product will contain 100% certified ingredients.**
- 10.4.2 **A Transition Bio-Gro product may contain up to 15% uncertified ingredients. Labelling of Transition Bio-Gro products must include the**

These Standards are subject to constant review, but otherwise remain valid until 31/12/92.

Copyright New Zealand Biological Producers Council (Inc).

uncertified ingredients and their percentages clearly marked. Any uncertified ingredient being used in any certified product must be residue tested before being used unless such requirement is waived in writing by the Council.

10.4.3 Water is not included in the ingredient list but care should be taken to ensure that the water used is of a satisfactory purity. Evidence of such purity may be required by the Council.

11.0 Packaging guidelines.

11.1 It is not possible to specify the best packaging for each product as local options differ and are subject to frequent change. The following guidelines offer criteria for choosing packaging types. The Council may withdraw certification if a package contravenes these guidelines or if a one-trip package is used without good reason.

11.2 The packaging must not contain any substance capable of contaminating the product during its maximum shelf life, eg. paper products bleached with chlorine and so likely to contain dioxin.

11.3 Any use of the trade mark on packaging, other than Council-supplied stickers must be submitted to the Council in writing indicating layout, wording and colours for the written approval of the Council before printing. The packaging must enable the display of essential product information, grower identification and the Council's trade mark.

11.4 When disposed of, the package must not pose serious danger to people, wildlife or water quality either while still intact or through its breakdown products.

11.5 Within these constraints the package should use the minimum energy and resources. Regardless of the material used, this criterion will best be met if the package is reused as many times as possible, ie. washed and refilled, or failing that, is recycled, ie. broken down to form a new package. Recycling the glass only is not as energy efficient. Packages shall not be regarded as reusable or recyclable unless a system exists for their return which achieves an acceptable return rate. This excludes all plastics, tin cans and glass containers which are not accepted back for recycling by the manufacturer. If a packaging type is available which is currently reused

or recycled, producers are expected to use it, but there are very few options available at present.

11.6 If there is no alternative to a one trip package the factors to be considered are:

11.6.1 The total quantity of packaging should be minimised.

11.6.2 Renewable resources (paper, wood) are preferable to non-renewable (metals, plastic).

11.6.3 Packages should squash easily to reduce space on trucks and in rubbish landfills.

12.0 **Processing dairy products.** Milk and dairy products must be produced from animals that conform to the Council's Standards. The operation must be managed in an ecologically sound manner by controlling shed effluent, as well as detergents and sanitisers which are potential pollutants. Hygiene and quality requirements outlined in the Dairy Industry Act and the Milk Production and Supply Regulations apply.

12.1 If milk is to be processed or packaged, the premises involved must also be inspected or certified to ensure that the fidelity of the milk is maintained through to the final product.

12.2 **Milk and Cream.** Every effort must be made to minimise physical damage, biological and chemical contamination or adulteration of milk. (Refer to MAF Dairy Division Manuals).

12.2.1 Sterilisation of milk contact surfaces with steam or hydrogen peroxide with occasional caustic soda is recommended.

12.2.2 Sanitisers approved by the National Dairy Laboratory are permitted provided that all milk contact surfaces are thoroughly flushed with clean water immediately after their usage to ensure that any residual sanitiser is removed.

12.2.3 A high standard of presentation and packaging should be used to ensure that quality of the product is maintained through to the consumer. Reusable glass packaging should be used. Plastics and foils are restricted packaging materials requiring the Council's approval. (See section 11).

BEST AVAILABLE DOCUMENT

- 12.3 **Butter.** Unrefined sea salt with no additives is permitted. All artificial colourings, flavouring, preservatives or additives are prohibited.
- 12.4 **Yoghurt and other cultured products.** Milk may be heated to 82 degrees centigrade and certified bacterial starter cultures should be used. Certified fresh or preserved fruit and honey should be used while sugars, herbs and spices from conventional sources are restricted and are subject to the Council's prior approval in writing. Artificial colourants, stabilisers, flavouring and other additives are prohibited.
- 12.5 **Cheese.** Milk may be pasteurised to 74 degrees centigrade and certified whey or bacterial starter cultures may be used. Unrefined sea salt with no additives and certified animal or vegetable rennets are permitted. Synthetic rennet, colourants and all other chemicals are prohibited. Equipment must not be greased with liquid paraffin. Pure vegetable oils or greaseproof paper are permitted for packaging. Plastic films and foils are restricted packaging materials (See section 11).
- 12.6 **Other dairy produce.** Natural spices, aromatic plants and herbs used should be from certified sources, while those from conventional sources are restricted. See section 10 and contact the Council for guidance.
- 13.0 **Meat processing.** Killing, cutting, packing, marking & further processing are subject to (MAF) Abattoir Procedures (General), the Meat Act, the Food and Drug Act, and their regulations, and the Stock Regulations (Insecticides and Oestrogens). MAF Meat Division Manuals 8, 9, 10 and 11 provide detailed information for use in abattoirs and packaging areas to cope with changing situations. The regulations are comprehensive and stringent and in most cases adequate for the treatment of certified products. However, some further restrictions apply:
- 13.1 **Transport of livestock** for slaughter should minimise any pain and distress to the animals. In addition all certified livestock should be clearly and permanently identifiable so that no confusion is possible.
- 13.2 **Slaughter of stock** should minimise physical pain and distress to the animals. Following slaughter, processing systems must ensure that all certified meat products retain their identity and do not come into contact with prohibited materials.

- 13.3 **Chemicals.** Manual 10 of the MAF Meat Division Manuals lists the chemicals which may be used in edible product areas in abattoirs. The following further restrictions apply when certified stock is being processed:
- 13.3.1 **Insecticides** which have rapid 'knockdown' and no residual activity can only be used in edible product areas processing certified product provided that:
- 13.3.1.1 Only products permitted or restricted in these Standards are used.
- 13.3.1.2 No certified meat is in the area during application.
- 13.3.1.3 All contact areas are washed down with water prior to the introduction of certified edible product to the area.
- 13.3.2 At present time only category 'A' pyrethrins can be used for insect control in certified edible product areas.
- 13.3.3 Restrictions on insecticide odours, confinement of sprays and mists, labelling and storage of insecticides and the use of insecticidal fume bombs as described in Manual 10 apply.
- 13.3.4 **Rodenticides** must not to be used in certified edible product areas within five days of the commencement of certified meat slaughter and processing. (See section 1.17.3). Contact surfaces must be thoroughly washed before certified meat is reintroduced to the area.
- 13.3.5 **Sanitising, cleaning, and adhesive materials** listed in Appendix E of Manual 10 are restricted products in edible and non-edible product areas.
- 13.3.6 No chemicals may be sprayed or otherwise applied when certified edible product is in the area. All contact areas must be washed down with potable water after the use of any sanitising or cleaning materials if edible certified product is to be processed.
- 13.4 **Carcass marking.** Until a suitable certified marking agent is identified only manufacturing grade 1 chocolate brown may be used to mark certified carcasses or meat. The feasibility of using non-coal colouring agents such as cochineal, chlorophyll, saffron or liquid nitrogen branding should be investigated.

- Wooden casks Stainless steel or glass equipment.
- 15.3.2 **Prohibited:**
All other containers and equipment.
- 15.4 **Fruit & vegetable juices.**
- 15.4.1 **Recommended:**
Centrifuging. Untreated lemon juice as a preservative.
Stainless steel, muslin and kieselguhr (diatomaceous earth) for filtration.
- 15.4.2 **Permitted:**
Unrefined sea salt with no additives, rock salt or low sodium salt in vegetable juices.
- 15.4.3 **Restricted:**
Ascorbic acid Citric acid.
- 15.4.4 **Prohibited:**
All other materials.
- 15.5 **Wine making.**
- 15.5.1 **Recommended:**
Natural aging.
Centrifuging. Cultured or natural yeasts.
- 15.5.2 **Permitted:**
Natural lemon juice.
Chaptalisation with 100% pure sugar.
The addition of unfermented certified grape juice.
Clarification may be assisted using fresh egg whites, pure casein, food quality natural gelatin, bentonite, kaolin and *calcium carbonate*.
- 15.5.3 **Restricted:**
Ascorbic acid.
Sulphur dioxide either as gas or metabisulphite can only be used if the final Sulphur dioxide concentration is below those indicated:
Maximum permissible *Sulphur dioxide* levels in certified Wine:
- | Sugar
g/litre ⁻¹ | Total sulphur dioxide
mg/litre. |
|---------------------------------------|------------------------------------|
| less than 5 (Dry) | 110. |
| more than 5 but less than 30 (Medium) | 200. |
| more than 30 (Sweet) | 250. |

- produce. Reductions, pasteurisation and purees are all recommended.
- 15.7 **Spreads.** All ingredients used to make spreads must be certified produce.
- 15.7.1 **Recommended:**
Certified oils, herbs and spices.
- 15.7.2 **Permitted:**
Natural methods of preserving and pasteurising.
Unrefined sea salt with no additives.
- 15.7.3 **Prohibited:**
Synthetic emulsifiers, thickeners, anti-oxidants, flavour enhancers and all chemical and synthetic additives.
- 15.8 **Other vegetable & fruit products.** See section 10 and contact the Council for guidance.
- 15.9 **Packaging.** See Section 11.
- 16.0 **Honey & honey dew production.**
- 16.1 **Isolation.** If hives are situated further than 5 kilometres from conventional agriculture, horticulture or exotic forests the honey must be residue tested for the first two years. If these tests are consistently below acceptable limits only random testing will be subsequently required at the discretion of the Council.
- 16.1.1 If hives are situated less than 5 kilometres from uncertified agriculture, horticulture or exotic forests, residue testing all batches of honey is compulsory due to the high risk of contamination.
- 16.2 **Management.** Only permitted materials and practices specified in these Standards are permitted in any beekeeping system, (See sections 1.16, 1.17, 1.20), including:
- 16.2.1 Vegetation control around the apiary.
- 16.2.2 Preservation of honey frames. Paraffin wax dipping is permitted for preservation of timber used for construction of the brood and honey chambers. Use of *Copper naphthalene* preservative will not be permitted for use on new woodware, and if it has been used on existing woodware

the bees and the honey tested for ~~Copper naphthenate~~ residues.

- 16.2.3 Control of pests or diseases within hive.
- 16.2.4 Smoker fuel.
- 16.2.5 Removal of bees from honey supers.
- 16.2.6 Protection of stored honeycombs used in the production of certified honey.
- 16.2.7 Control of insects during extraction or packaging.
- 16.2.8 Replacing wax in frames must be done with certified foundation wax. Comb honey is only eligible for certification if the foundation wax used has certification. An inspection of the wax processing facility may be required at the producers expense, before foundation wax will be certified.
- 16.2.9 Routine sugar feeding is not permitted and emergency use of sugar must not occur to within 4 weeks of the start of honey flow.
- 16.3 Extraction processes must prevent contamination of certified honey, including clear labelling of supers containing certified honey and complete clean down of the honey house before extracting, processing or packaging certified honey.
- 16.3.1 Honey temperatures must not exceed 35 degrees centigrade during extraction and packaging and care must be taken at all times to minimise the potential for heat damage. If temperatures exceed 35 degrees centigrade during extraction or straining of manuka and ling heather honey, an HMF test must be performed and the HMF level must not exceed 8 mg/kg. Any heated honey may still be certified as long as it is labelled "for processing use only".
- 16.3.2 Strainer size should not be less than 200 microns. Only certified honey may be used for seeding to promote fine granulation.
- 16.4 **Residue testing.** Each batch must be sampled after thorough stirring of the vat and a minimum 50g sample retained for 12 months or until the next inspection. If required the sample must be tested at an approved laboratory for presence of pesticides and HMF levels. If documentation is provided on pesticides used within a 5 km radius of hive sites, only these pesticides need to be tested for. In the absence of any such documentation a broad spectrum residue test must be performed.

coded in such a way that it can be traced back to the individual batch sampled for testing. This provision applies even after sale by the original producer, if the honey is being repackaged by an uncertified third party who wishes to display the Bio-Gro trade mark. An inspection of the repacking facility may be required before the Bio Gro trade mark may be so used. Prior approval in writing from the Council must be obtained before any Bio-Gro honey is repacked for sale as Bio-Gro honey by any facility that has not been certified or inspected by the Council.

17.0 Residue levels in certified systems.

- 17.1 The **Bio-Gro** trade mark is a guarantee that the product has been produced according to the Council's Standards. It is not a guarantee that the product is free from the residue of environmental pollution. The distribution of synthetic chemicals is now so widespread that such an assurance would be meaningless.
- 17.1.1 Contamination from chemical residues are not acceptable in a certified product unless the reason is general environmental contamination. In such cases the contamination must be declared to the purchaser. For this reason any producer, at their expense, may be required to provide to the Council analytical data as it may require on soils, produce or product.
- 17.2 **Chemical residue levels in certified products.** The following is an extract from a list of chemicals covered by the New Zealand Food Regulations (1986)
- 17.2.1 The permissible level of residues used by the Council on food products is based on 10% of the maximum permissible residue level listed in the USFDA or New Zealand Food Regulations, whichever is appropriate. For example:

Chemical.	N.Z. Food Regulation. mg/kg	Council Standard. mg/kg.
D.D.T.	5	0.5
Dieldrin, Aldrin	0.2	0.02
Lindane	2	0.2

in manures and composts must not exceed:

	mg/kg.
Zinc	1000
Copper	400
Nickel	100
Cadmium	10
Lead	250
Mercury	2

- 17.3.1 The potential annual addition of heavy metals to the soil by manure additions will also be subject to certain limits. Any analyses required will be at the expense of the applicant or licensee. (See section 3).

18.0 Interpretation.

The interpretation given to the meaning of these Standards shall be that given by the Council's Executive Committee, in its sole and absolute discretion. In all appropriate cases the singular includes the plural and the masculine includes the feminine and vice versa.

To avoid any conflict of interests, the NZ Biological Producers Council does not offer an advisory service beyond particular help with interpretation of its Standards as they relate to what can and can't be done on Bio-Gro registered properties. However Council office staff can help you if you are seeking management advice. For assistance with this, you should first contact:

- * **NZ Biological Producers Consumers Council (Inc)**
P O Box 36-170
Northcote, Auckland 9.
Tel: 64-9-4438435
Fax: 64-9-4438436

Help may also be available from:

The Soil & Health Assn of NZ (Inc)
P O Box 36-170, Northcote, Auckland 9.
Tel/Fax: 0-9-4806650.

The Bio-Dynamic Farming & Gardening Assn
P O Box 306, Napier.
Tel: 0-6-3352428.

Some books are available from libraries or local book shops and a recommended reading list is available from the New Zealand Biological Producers Council office. Please include a stamped addressed envelope with your request. Appropriate books may be purchased from:

Doubleday Research Assn of NZ
7 Colum Place, Bucklands Beach
Auckland.

Their catalogue of over 200 titles is available by sending one business size stamped addressed envelope.

The New Zealand Biological Producers Council was formed by representatives of the Bio-dynamic Farming and Gardening Assn, the Doubleday Research Assn of NZ and the Soil & Health Assn of NZ.

THE OIL COMPANY®

BESPOKE AROMATHERAPY

Welcome to The Oil Company — The Company that is committed to bringing Pleasure and Balance into your life

Here at The Oil Company, we specialise in Aromatherapy, that is the use of Pure Essential Oils and massage to help promote health and healing in the Mind and Body.

Our Aim is to present Aromatherapy in a simple and accessible way, giving you the choice to become as involved in the subject as you wish. Our qualified Aromatherapist is on hand to offer advice on the selection of our wide range of Pure Essential Oils, or to make a Personalised (Bespoke) Oil Blend at your request.

The Oil Company manufactures the Bath, Shower, Massage and Relaxation products, containing Pure Essential Oils. We also have an original selection of Gift ideas. We will make up Gift Boxes of your choice, and we regularly introduce new products to help keep Gift Buying exciting.

Our experienced staff are here to offer advice, and help in any way that will make your shopping experience with us more pleasurable.

At The Oil Company, you can gain qualified advice on selecting the most appropriate Oils to use at home, or try any of our Bath/Shower and Relaxation products, or just enjoy the enchanting aroma and atmosphere of an early Roman Bathhouse.

BEST AVAILABLE DOCUMENT

The Oil Company also offer a mail order service.
For further information please contact:
The Oil Company
P.O. Box 3454
Auckland
Ph: (09) 522 0416

THE OIL COMPANY PRINCIPLES.

STATEMENT OF QUALITY.

The Oil Company Essential Oils are 100% Pure, Natural and Undiluted. They are extracted from crops grown under the authority of Certified suppliers from around the world. They are guaranteed to be of the highest quality. Aromatherapy is a scientifically validated method of healing, and only Essential Oils of the highest standard are appropriate for therapeutic use. The Oil Company is able to guarantee the consistent quality and high standard of the pure Essential Oils stocked and sold.

ORIGIN

The Oil Company is proud to be New Zealand made. We design and manufacture all our products in New Zealand.

ENVIRONMENT

The Oil Company is conscious of our environment and everything in it, and endeavours to avoid excess or damage to it in any way during the formulation and creation of our products.

PACKAGING

Prices are kept to an acceptable level. Our packaging is minimal. Using New Zealand timber from a sustainable source, we provide high quality gift boxes. We also use recycled paper to make our carry bags. We have no pressurised containers, carry the minimum of plastic and our glass bottles are recyclable. All our products are Cruelty-Free, we do not believe in Animal Testing.

BESPOKE SERVICE

A unique Service offered by The Oil Company is our Bespoke Service. Bespoke means personalised service, and our in-store Aromatherapist will discuss and advise the treatment you may require. A personalised formula will be made up for you, and recorded, so it can be repeated at a later date at your request.

WHAT ARE ESSENTIAL OILS?

Essential Oils are highly concentrated, aromatic and volatile substances extracted from a single part of the plant. Essential Oils are found in flowers, leaves, roots, herbs, seeds and tree bark resin.

HOW DO ESSENTIAL OILS WORK?

Essential Oils take effect almost immediately on the body and mind. Through our sense of smell, our brain starts to react to an oil in a matter of seconds. The body absorbs the oil massaged into the skin, through the hair follicles and into the bloodstream in minutes. All Essential Oils contain powerful antibiotic properties and work to strengthen the immune system.

HOW DO I USE THEM?

MASSAGE:

Essential Oils are highly concentrated and should not be applied directly onto the skin. They should be diluted in a cold-pressed vegetable or seed oil base. The recommended proportions are as follows:
1 drop of Pure Essential Oil to 2 ml of cold-pressed vegetable carrier oil. Or for babies and children under five, one drop to 10ml of oil and only using the recommended Essential Oils — under "Properties of Essential Oils."

FOR A FULL BODY MASSAGE:

20ml of Carrier oil(s) this may include one or more of the Base Oils. Add 10 drops of Essential Oils. Choose up to four Essential Oils and combine a few drops of each to make 10 drops in total.

FOR NECK AND SHOULDERS:

10ml of Carrier oil(s) this may include one or more of the Base Oils. Add five drops of Essential Oils.

The benefits of using Massage on a regular basis, not only helps improve circulation, stimulates the release of toxins and strengthens the immune system, but also provides a sense of warmth and wellbeing. Caring for yourself in this way will increase your self-esteem and sense of self-worth.

BEST AVAILABLE DOCUMENT

The following Carrier Oils can be used to make up 100% of the blends into which the Essential Oils may be added.

Sweet Almond	Peach Kernel
Apricot Kernel	Sunflower
Grapeseed	Soya Bean

The following Base Oils are too concentrated to use alone as a carrier oil and blend well with one of the above by adding approximately 10% to a blend.

Avocado	Sesame Seed
Evening Primrose	Wheatgerm
Jojoba	Walnut

It is recommended to use no more than four pure essential oils in one blend, as any more than this may inhibit their effectiveness. Another point to consider when buying oils, is the compatibility of one essential oil with another. Before choosing your essential oils we invite you to discuss with our Aromatherapist or trained staff, the best combination of oils to suit your requirement.

We supply Amber glass bottles and droppers to assist you in making your own blends at home.

BATHS:

A delightful way to release the stresses of the day and relax before bed, or to invigorate and refresh at the start of the day.

Run a bath and then add 5-10 drops of up to four oils. Disperse the oil molecules into the water with your hand. Keep the door and windows closed so the vapours don't escape and relax into the bath, breathing deeply for at least 10-15 minutes.

SUGGESTIONS:

- RELAXING: Chamomile, Lavender, Geranium
- STIMULATING: Rosemary, Pine, Lemon

For babies and young children dilute one drop of oil into 2tsp Carrier Oil before adding to the bath. Use no more than one drop of oil per bath.

OIL BURNER:

By using an Oil Burner, you can quickly create an atmosphere in your home or workplace, calm fractious children and prevent and heal colds and flu, to name but a few of the uses.

Fill the bowl two thirds with boiling water, add up to eight drops of oil and light the candle.

SUGGESTED BLENDS:

- FOR CONCENTRATION, CLEAR THINKING AND STUDYING: Basil, Rosemary, Lemon
- ROMANTIC AND SENSUAL: Jasmine, Patchouli, Grapefruit
- UPLIFTING: Lemon, Rose, Orange
- RELAXING, SOOTHING AND REASSURING: Lavender, Geranium, Sandalwood

INHALATION:

Another way to balance physical conditions and emotions is by filling a glass or stainless steel container half fill with near boiling water. Add 2-3 drops of oil, mix with a fork to release the vapour. Place a towel over your head and breathe deeply for up to five minutes.

SUGGESTIONS:

- HAYFEVER: Chamomile, Lemon, Lavender
- SINUSITIS: Rosemary Peppermint, Eucalyptus
- ANXIETY: Lavender, Geranium, Neroli

LAMP RINGS:

Place lamp ring on an upright lamp bulb and place two drops of oil on the lamp ring, alternatively, if the bulb is on a hanging light, unscrew the bulb, place the lamp ring on the bulb and screw back onto the light. The heat of the light bulb will release the vapour of the oil in the lamp ring.

Essential Oils can be used in the rinsing water when handwashing to freshen laundry, e.g. Lavender, Lemon — 4-6 drops into a basin of warm water, rinse clothes and hang out to dry.

They can be used to refresh pot-pourri, sprinkled onto pomanders or made up into a room spray — 8 drops into 300ml of warm water. Add oil and shake the bottle before spraying.

They can be added to your Hair conditioner or moisturiser or hand & body lotion to suit your hair and skin types.

PLEASE NOTE: WE DO NOT RECOMMEND TAKING ESSENTIAL OILS INTERNALLY
ARE ALL ESSENTIAL OILS SAFE FOR EVERYONE TO USE?

No, not all essential oils are safe for everyone to use. Babies, children and pregnant women can only tolerate certain oils. Refer to the "Properties of Essential Oils" heading.

PROPERTIES OF ESSENTIAL OILS

• Emotional

† Physical

‡ Do not use during Pregnancy

Aniseed: Not recommended for use in an Aromatherapy massage. A useful oil to include in the care of your pets especially dogs. An effective breath freshener and toothpaste for dogs. Mix together 2 tsp of Baking Soda, 1 drop of Clove oil, 1 drop of Aniseed oil. Rub onto teeth with a damp cotton wool ball. Give your dog a drink of water.

Bay: † Caution is required when using this oil. It should not be used during pregnancy or on children or babies. Stimulates the circulatory system when a few drops are added to the bath. A useful antiseptic when used to treat bronchial problems. For colds, combine with eucalyptus and inhale.

Basil: • Aids concentration and improves memory. Encourages decisive action and clarity of thought. For studying, use in combination with Rosemary to enhance thought processes. † An antiseptic and expectorant that can be used to treat respiratory infections. A nerve tonic whose antispasmodic effect relieves migraines and settles digestion. Should not be used on children under 7. For children over 7 use 1 drop per 5ml of Carrier Oil.

Bergamot: • An uplifting nerve sedative that calms anxious states and dissolves nervous tension. † A valuable treatment for skin infections such as acne, eczema, dermatitis. Use in 1% dilution for skin problems. Also effective in the treatment of urinary tract infections. Recommended to combine with Lavender for treatment of tonsillitis. An effective deodorant and insect repellent. For use on adults and teenagers 13 years and over.

Blackpepper: † Caution is recommended when using this oil and the amount used should be proportionately lower in massage blends than other oils. Contains stimulating and tonic properties. Ideal for Dancers and Athletes to prevent stiffness and muscular pain before training and performance. Stimulates the pancreas to produce

new blood cells and is useful in the treatment of Anaemia. Creates heat in the body. Good for circulation, coughs, colds, congestion, chills, stimulates digestion. Not recommended for children under 13.

Cedarwood: • Calming and relaxing. Releases tension and helps relieve chronic anxiety. † Brings relief to coughs, catarrh and bronchitis. For treatment of all respiratory conditions especially those associated with anxiety and nervous tension. For urinary tract infections and cystitis. For treatment of acne, oily skin and dandruff. An effective insect repellent. Should not be used on children under 13.

Chamemile Roman: • Extremely calming, soothing to mind and body. Anti-inflammatory and sedating. For oversensitivity and irritability. For emotional imbalance and effective treatment of insomnia. Especially useful for babies and children to calm and soothe. Totally safe for use on newborn babies. 1 drop in 30ml Carrier Oil. † For treatment in any condition where there is inflammation. Antispasmodic, soothes aches and pains in muscles, bones and organs. For allergies, dermatitis, eczema, insomnia and headaches. Recommended for use during pregnancy (after the first three months if there is a history of miscarriage), and for babies and young children.

Cinnamon: Not recommended for use in Aromatherapy massage. Can be used in room sprays or on an oil burner to create a festive atmosphere e.g. Christmas Blend: Pine, Mandarin and Cinnamon.

Clary-Sage: • Very calming, relaxing and sedative. Induces euphoria. For post natal depression or depression after an illness. Warming and strengthening. † Relieves tension and stress. A powerful muscle relaxant and antispasmodic for treating migraines and menstrual cramps. Good for throat infections and menopause. Not to be used during pregnancy, but is recommended for use during childbirth — facilitates the birth and helps breathing by calming the lower part of the spinal cord. Not to be used on children under 5. Dosage 5 drops in 30ml Carrier Oil, for 5 years and over.

- Clove:**
P • Has an antibacterial, antiseptic and analgesic action. Can help prevent infection. Relieves toothache. Can be included in the treatment of asthma, nausea and sinusitis.
- Cypress:**
P • Relaxing and refreshing. Astringent and drying quality. Good if your mind can't stop or you can't stop talking, helps relax.
† Wherever there is an excess of fluid. Excessive perspiration, sweaty feet, retained fluid/cellulite, oily skin, haemorrhages. Antispasmodic, for treatment of asthma, and whooping cough. Regulates menstrual cycle, relieves period pain and reduces heavy flow. Sedates the respiratory system. Not to be used on children under 7.
- Eucalyptus:** † Powerful antiseptic, anti-viral expectorant and lightly antispasmodic. A natural remedy for colds, to ease congestion, fight infection, and to clear the head. Cooling, reduces fever, relieves sunburn, muscular aches, arthritic pain and rheumatism. Promotes healing, helps form new tissue. Safe to use during pregnancy and safe to use on babies from two months. One drop 10ml of Carrier Oil.
- Fennel:**
P † An excellent digestive remedy that helps relieve nausea, indigestion and constipation. For fluid retention and cellulite. Maintains muscle tone and skin elasticity. Regulates menstrual cycle, brings relief to P.M.T., balances fluctuating hormone levels. Helpful in menopause. Encourages milk flow in nursing mothers. Not to be used on children under 6. For children over 6, 1 drop to 8mls carrier oil.
- Geranium:** • Harmonising and emotionally balancing. A relaxing and refreshing anti-depressant.
† Regulates and balances all hormones. Useful in treating P.M.T. and menopause. Vital in treatment of endometriosis. Stimulates lymphatic system and is a diuretic, so is excellent in the treatment of cellulite. Balances oily and dry skin. For eczema, chilblains, cold sores and as an insect repellent, peptic ulcers and diarrhoea. Safe for use during pregnancy and during childbirth. Can be used on babies from three months. One drop to 10ml of Carrier Oil.

- Ginger:** † Warming and drying. Especially effective in dealing with too much moisture in the body. Internal: Catarrh and diarrhoea. External: Winter related ills and rheumatism. Blends well with orange and other citrus oils. A single drop can be added to blends for arthritis, muscular pain and fatigue. For broken bones and to aid digestion. Safe to use during pregnancy, for treating oedema. Children from one year, 1 drop to 6ml of Carrier Oil.
- Grapefruit:** • Refreshing and uplifting tonic. Helps release pent up anger and frustration. Helps to encourage the decision making process, and aids concentration. A refreshing anti-depressant.
† Has tonic effect on liver and gallbladder. Safe to use while pregnant and on children from 1 year, 1 drop to 8mls carrier oil.
- Hyssop:**
P † Caution is required when using this oil. Valuable for treating chest infection, helping to liquify thick mucus to enable the body to expel more easily. Stimulating tonic effect on heart and respiratory system. Use in inhalations for coughs and sore throats. For bruising, apply a cold compress, and for rheumatism, apply a hot compress. Not to be used during pregnancy or on children under 7. Not to be used if suffering from Epilepsy.
- Jasmine:** (Jasmine Absolute also available, please enquire.) • Known as the King of oils. Relaxing, emotionally warming, powerful antidepressant and stimulant, helps overcome a lack of confidence. Aphrodisiac.
† Valuable uterine tonic, helpful in childbirth to relieve pain, strengthens contractions, aids post-natal recovery, strengthens male sexual organs. For skin conditions such as hot, dry and sensitive skin. Safe to use during pregnancy.
- Juniper:**
P • Calming, reduces anxiety, sedating, strengthening, nerve tonic, cleansing to both mind and body.
† Powerful detoxifying diuretic. Effective treatment of cellulite, helps clear weight from the mind and body. For pre-menstrual fluid retention, for treatment of cystitis, rheumatism, gout, arthritis. Stimulates circulation and purifies blood. Astringent, antiseptic, excellent treatment for acne or children's colic. Safe to use from 3 years 1 drop to 8mls carrier oil.

Lavender: • The most indispensable and versatile of essential oils. Calming, soothing, balancing. For all conditions associated with nervous emotional problems. Lavender restores body and mind to a state of balance where healing can take place.
† A natural antiseptic, anti depressant, sedative and detoxifier. Promotes healing, increases white blood cells, prevents scarring, excellent for burns, sunburn, eczema, acne. For the relief of headaches, migraines and insomnia, for asthma and bronchitis, sinus, coughs and flu. Highly recommended for use during pregnancy (after the first three months if there is a history of miscarriage) and childbirth, and for use on children and babies from one day old, one drop to 30ml of Carrier Oil. Effective insect repellent and for use on insect bites and stings.

Lemon: • Refreshing, uplifting, strengthening and consolidating. Clears the mind and aids the decision making process.
† A natural antibiotic, helps the body defend itself against infection, purifies the blood, promotes healing of cuts and wounds. Tonic to digestive and circulatory systems. Useful in treating respiratory infections, helps reduce temperatures. Astringent, good for oily skin. Use sparingly and do not use in the bath as it can irritate the skin. Can be used on children from one year. 1 drop to 8mls carrier oil.

Lemongrass: • Extremely refreshing and powerful tonic. Has a stimulating effect on the nervous system. Good for shock or if you feel you have "had enough".
† An antiseptic and antibacterial oil, particularly effective against infectious illnesses and fevers. An effective insect repellent and deodorant. For sports accidents and sprains, muscle aches, pains & blood blisters. Can be used on children from 5 years, 1 drop to 5mls carrier oil.

Mandarine: • Calming and uplifting with a gentle tonic effect.
† Tonic for stomach and liver. Calming effect on intestines. Ideal for elderly people and children especially for upset tummies. Safe to use during pregnancy and on children and babies from two months, one drop to 10ml of Carrier Oil.

Majoram: • Calming, comforting, warming and sedative. Warming action on the mind, body and emotions. Very effective in treating insomnia especially when used with Lavender and Chamomile in a warm bath. Not recommended if suffering from depression.
† Brings relief to headaches and migraines, asthma, colds and bronchitis. For muscular stiffness, arthritis and brings relief to menstrual cramps. Do not use on children under 13.

Melissa: (Absolute only available.) • For extreme grief and shock, to soothe, calm and uplift. Helps to eliminate black and heavy thoughts, raises the spirits. Use in very low concentration 1% dilution.
† Has an extremely calming and regulating effect on the menstrual cycle, regulating ovulation. Helps lower high blood pressure and calms over rapid heartbeat and breathing. For dramatic improvement of respiratory and skin ailments and allergies. Anti-viral. Not recommended for use on children.

Myrrh: • Rejuvenating and strengthening. Opening, heating and drying nature.
† Antiseptic, anti-inflammatory. A very effective expectorant in the treatment of chest infections, bronchitis, colds and sore throats, has a heating and drying effect. A valuable healing ointment for cuts and chapped skin, useful treatment of Thrush. Do not use on children under five years. Over 5 years 1 drop of oil to 8mls of carrier oil.

Neroli: (Absolute also available — please enquire). • One of the most effective sedative and antidepressant oils. Calms and slows down the mind to relieve states of anxiety and depression. Useful treatment of insomnia and hysteria. Helps to centre and focus the mind.
† Rejuvenating, stimulates the elimination of old cells and the growth of healthy new ones. Best suited to dry and sensitive skins. Useful treatment for diarrhoea. Safe to use during pregnancy, in particular during labour to facilitate easy breathing helping to avoid hyperventilation. Safe to use on children and babies from two months, one drop to 10ml of Carrier Oil.

Nutmeg: † Caution must be used and a lower percentage is recommended. Children from five years, 1 drop in 10ml of Carrier Oil in a blend containing Geranium and Chamomile to treat insomnia. It is not recommended for use during Pregnancy but recommended for use during labour and delivery to calm the central nervous system, alleviating anxiety. Helps increase circulation.

Olibanum/Frankincense: • This oil has been used for thousands of years in religious ceremonies. It is rejuvenating and has a soothing and elevating effect on the mind, slowing down and deepening the breath. Helps to connect with your 'inner self'. Helps prevent nightmares.
† Excellent expectorant and effective in the treatment of respiratory and catarrhal infections, coughs, colds, bronchitis and asthma. rheumatism, aches and pains. Revitalises mature skin. Will help preserve a youthful complexion. Can be used on children 7 years and over, one drop to 6ml Carrier Oil.

Orange: • Refreshing and uplifting. Transforms depression into peace and joy.
† Brings relief to acute headaches. Sleep inducing. Antidepressant, antispasmodic and mildly sedative. Safe to use during pregnancy and for children and babies from 7 months, one drop to 10ml of Carrier Oil.

Patchouli: • Stimulating, promotes sensual awareness. Anti depressant aphrodisiac. Helps bring about mental clarity, and encourages the ability to deal with problems objectively.
† Strong nerve stimulant. Stimulating in small doses, sedates in larger doses. Antiseptic, anti-inflammatory, fungicidal and astringent. A cell regenerator, valuable in the treatment of chapped and cracked skin. Promotes healing of scar tissue. Safe to use during pregnancy and for children from 2 years old, one drop to 6ml of Carrier Oil. Especially helpful in the treatment of constipation in children and pregnant women.

Peppermint: • Cooling, stimulating and encourages clear thinking.
† Especially helpful in bringing relief to stomach and digestive system upsets. Relieves nausea and indigestion, headaches associated with stomach upsets. Soothing and cleansing for sinus, lungs and bronchial tubes. Safe for use on children five years and over, one drop to 6ml of Carrier Oil.

Petitgrain: • Can be used as a less expensive alternative to Neroli. Makes a wonderfully refreshing bath oil with deodorant properties. This oil stimulates the mind, supports the memory and is relaxing and balancing. Safe to use on children from 5 years, one drop to 10ml. Safe to use while pregnant.

Pimento: † As a treatment for indigestion and flatulence. Has a tonic effect on the digestion. Not recommended for use on children under 13.

Pine: • Refreshing and stimulating.
† Powerful expectorant and antiseptic to the lungs. Effective in the treatment of colds, catarrh and sore throats. Excellent for chest infections. Stimulates circulation and relieves muscular pain. Can be used on children from one year. One drop in 10ml Carrier Oil.

Rose: (Absolute also available please enquire.) • The Queen of essential oils. Opening the heart to emotional expression and love. Cleansing and purifying, bringing balance and harmony both physically and emotionally. A gentle yet potent anti-depressant. For jealousy, envy, resentment, anger.
† Powerful cleaning, regulating and tonic effect on the uterus and blood stream. Regulates menstrual cycle. Excellent in the use of skin care, especially dry, sensitive skin. Soothing, cleansing effect on the liver, for nausea and vomiting. Safe to use during pregnancy and in the delivery room to assist with the birth. Helps relax the uterus and soften ligaments to encourage the pelvic bones to expand. Not recommended for use on children below 13.

Rosemary: • Invigorating, stimulating. Powerful nerve stimulant. Aids all thought processes and encourages mental clarity especially when used with Basil. Improves memory.
† Works on central nervous system to heal and stimulate nerve functions. Valuable for many respiratory conditions. Use in massage or bath to relieve tired, stiff or overworked muscles, rheumatism and arthritis. Tonic for the heart, liver and gall bladder. Classic remedy for headaches and migraines. Great for foot baths or as an invigorating bath oil. Promotes healthy hair and scalp. Safe to use on children from 5 years, one drop to 6ml Carrier Oil.

- Sage:**
P Not recommended for home use. Use only under the guidance of a qualified aromatherapist.
- Sandalwood:**
P • Strengthening, protecting and grounding. Relieves nervous tension and anxiety. Use for protection from a stressful environment, place a small drop on the back of the neck for protection. Encourages self-confidence.
† Valuable for chest infections and respiratory conditions, coughs, bronchitis, sore throats and laryngitis. Soothing for dry and dehydrated skin yet good for oily skin and acne. An effective treatment of kidney problems and urinary infections, also digestive and reproductive systems. Helps metabolise body fat. Improves elastin and collagen fibres of the skin. Safe to use on children from 1 year, one drop to 6ml Carrier Oil.
- Tea Tree:** † Extremely powerful antiseptic, active against bacteria, fungus and viruses. Strengthens the immune system. Use in the bath and gargle a few drops in a glass of warm water at the first sign of a cold. Excellent remedy for cold sores, warts, tinea or infected open wounds and sores. To treat respiratory system, asthma, bronchitis, insect bites and stings. A useful disinfectant to use in the bathroom and toilet. Safe to use on children from six months, one drop in 10ml Carrier Oil. Safe to use during pregnancy.
- Tangerine:** • Uplifting and encourages feelings of cheerfulness, inspiration and strength. Eases tension, fear, sadness and irritability.
† Especially recommended for use during pregnancy as a treatment to avoid stretchmarks. Safe to use on children and babies from 6 months, one drop to 10ml Carrier Oil.

- Thyme:**
P • Stimulating, energising and uplifting. Revives and strengthens mind and body.
† Valuable in the treatment of all respiratory infections, colds, flu and sore throats. Gargle or mouthwash for throat infections or mouth ulcers. Stimulates circulation and increases production of white corpuscles. Safe to use on children from 7 years, though best used on an oil burner for the treatment of colds and flu.
- Vetivert:**
P • Deeply relaxing for anyone experiencing stress.
Regenerative and earthy.
† Soothing for tired, irritated and mature skin. Blends well with Sandalwood and Jasmine. To treat reproductive system, aids digestive function in the intestines. For use on young adults and adults only, not suitable for children.
- Ylang-Ylang:** • Relaxing, calming, soothing, aphrodisiac. Encourages sexual confidence and inner trust. Uplifting and euphoric.
† Slows down and deepens the breath. Calms anxious states lowers high blood pressure and nervous tension. Balancing and soothing on both dry and oily skin. Safe to use during pregnancy but not on young children.

COLD PRESSED CARRIER OILS:

Can be used as Carrier Oils with The Oil Company Essential Oils or by themselves. Can be used as 100% Carrier Oils. Available in 100ml and 200ml sizes. • Use in addition to a carrier oil 10% dilution.

- APRICOT KERNEL:** Suited to all skin types, especially mature, dry or inflamed and sensitive skin. Makes an ideal facial oil to be massaged into the face and neck.
- GRAPESEED:** A very light oil, easily absorbed making it a good choice for massage or for use as a bath oil. Also makes a moisturising after bath rub.
- PEACH KERNEL:** A nourishing oil containing Vitamin A and C. Another ideal facial oil, and for use on the neck to moisturise and hydrate.
- SWEET ALMOND:** Most commonly used as a Carrier Oil as it blends well with essential oils and is light in texture though rich in protein and Vitamin E and F to soften and smooth the skin. Makes an ideal massage or bath oil, and an effective body moisturiser. Is mild enough to use on babies and young children or anyone with sensitive skin.
- SOYA BEAN:** A non-absorbent oil that is suitable to use as a massage oil for a long massage where oil is needed to stay on the surface of the skin.
- SUNFLOWER:** A moisturising bath and body oil that is mild and leaves the skin feeling soft and supple.
- **SESAME SEED:** Suits all skin types and is especially good in the treatment of Eczema, Psoriasis. Can be used in a massage or bath oil, and makes an excellent sunscreen as it absorbs the sun's harmful ultra-violet rays.
- **WALNUT:** A natural sunscreen oil to include in sunscreen formulas, also a good oil to use in a treatment for scaly scalps. Can be taken internally to help improve the texture of the skin.
- **WHEATGERM:** A natural antioxidant and source of Vitamin E. Ideal to use in the treatment of Eczema, Psoriasis and to prevent ageing of the skin. Soothes, heals and softens the skin, helps to heal scar tissue.

COLD-PRESSED BASE OILS:

Available in 50ml size only. Can be used in addition to a carrier oil using 10% dilution, or can be used by themselves except carrot oil which is an essential oil and needs to be diluted before applying to the skin.

- AVOCADO:** Rich in vitamins, proteins and fatty acids. Especially high in vitamins A and B and has penetrating and stable qualities. For all skin types, particularly dry and dehydrated skin and those suffering from eczema.
- CARROT:** (An essential oil in its own right, but often used in massage blends.) Rich in Beta-carotene, a natural source of vitamin A. This oil helps keep the outer skin layers supple and protects skin from infection. Helps prevent premature ageing of the skin. Also dry, itchy skin, eczema and psoriasis.
- EVENING PRIMROSE:** This oil contains a rich source of gamma-linolenic acid which is converted in the body to an essential fatty acid, prostaglandin E1, which is vital for cell membrane growth and healthy skin. Highly recommended for dry, scaly skins, eczema and is successful in the treatment of P.M.T. and high blood pressure. Can also be taken internally, the recommended dosage is 1/2 tsp per day.
- JOJOBA:** This versatile oil is very similar to the skin's own sebum and is therefore easily absorbed. It is an excellent emollient for sensitive and acne prone skins as it helps balance the production of sebum. This oil does not oxidise easily and therefore remains stable for several years. It also helps to metabolise body fat, so can be used in addition to a slimming programme by applying to the areas of the body that are storing excess weight. It is ideal for treating, dry and damaged hair by smoothing and coating the hair shaft. Being resistant to acid, it is useful for babies with nappy rash, it also heals and protects skin from infection.

AROMATHERAPY BLENDED MASSAGE OILS:

FAT BUSTER CELLULITE OIL:

A powerful punch of Juniper, Fennel and Geranium to act as a detoxifying and diuretic treatment of cellulite, also bringing relief to hang-overs and nausea associated with having consumed too much alcohol.

SOOTHING MASSAGE OIL:

Lavender, Geranium, Sandalwood and Orange pure essential oils create an exquisite massage oil with relaxing and sedating properties. Can also be used as an effective treatment of eczema and dry, flaking or irritated skin.

FRESH FEET OIL:

An energising mix of Rosemary to stimulate tired feet and Peppermint and Cypress to soothe, deodorise and check perspiration. 'Fresh Feet' can also be used as a stimulating massage oil. It will clear the mind, stimulate the brain and encourage clear thinking, leaving you feeling refreshed, and ready to face the day.

HANDS ON OIL:

Benzoin to soothe rough dry skin. Chamomile and Sandalwood to soothe and heal irritation, leaving you with smooth soft hands. 'Hands on' can also be used as a warming, grounding and very calming massage oil, to reassure and encourage self confidence.

P.M.T. OIL:

To help bring relief from P.M.T. discomfort and period pain. Cypress, Chamomile and Bergamot combine to lighten, uplift and revitalise. Also contains Clary-sage, a muscle relaxant to help relieve menstrual cramps and Evening Primrose oil, which is excellent in the treatment of P.M.T.

HAIR AND SCALP TONIC:

Rosemary, Cedarwood and Lavender combine to encourage a healthy scalp and stimulate hair growth. Also contains Jojoba and Wheatgerm, that act as a tonic to treat conditions such as scaly scalp, dandruff, hair loss and dry split ends.

PREGNANCY STRETCHMARK OIL:

Containing Rose, Lavender, Tangerine and Carrot oils, also Wheatgerm to help maintain tone and elasticity in the skin, thereby preventing stretchmarks. Also has a balancing, cheerful and uplifting effect on the emotions.

SENSUAL MASSAGE OIL:

Jasmine and Patchouli oils that have for Centuries been reputed to have aphrodisiac properties, are contained in this blend. They encourage sensual awareness, are emotionally warming and help in overcoming a lack of confidence. Also containing Grapefruit to uplift and enhance mental clarity. Sensual Massage Oil will help create a sensual experience not to be missed.

LUXURY MASSAGE OIL:

Containing Rose, Jasmine, Geranium and Sandalwood. Rose is described as the Queen of essential oils and Jasmine the King of essential oils. Both are powerful anti-depressants, opening the heart to emotional expression and love. Geranium is the great balancer of emotions and Sandalwood is both grounding and reassuring. A truly luxurious combination.

INSOMNIACS MASSAGE OIL:

This relaxing, sleep inducing blend contains Lavender, Chamomile and Marjoram to slow down the mind, relax the body and encourage a gentle and sedative state where sleep occurs naturally.

BATH AND SHOWER

BATH SOAKS:

Contain blends of dried herbs, flowers, salts and essential oils in individual cotton sachets. Drop one sachet into the bath when running the water. When the bath is ready, squeeze out the sachet step in and relax.

Available in six different blends.

ACHING BODY: To ease aches and pains.

CLEOPATRA'S: A soothing Rose petal based blend.

MORNING AFTER: A gentle cleansing, tonic effect after over indulging.
REFRESHER: A refreshing blend to invigorate and start the day.
INSOMNIAC'S: To soothe and encourage a gentle night's sleep.
ADULTS ONLY: A gently stimulating blend containing Heart's Delight.

BATH BUBBLES:

A thick, rich coconut oil derived base available in six different fragrances containing pure essential oils with no synthetic fragrance added. Available in two sizes 125ml and 250ml.

ROSE AND JASMINE:	Relaxing and moisturising
ORANGE, GERANIUM AND MANDARINE:	Refreshing and uplifting
NEROLI AND GINGER:	Calms, relaxes and brings warmth
LAVENDER AND SANDALWOOD:	Relaxing and grounding – ideal for sensitive skins
FRANKINCENSE AND MYRRH:	Soothing and rejuvenating
PATCHOULI AND YLANG-YLANG:	Stimulating and uplifting

SOAPS:

100gm and mini novelty Glycerine soaps available in the same six essential oil combinations as mentioned under "Bath Bubbles"

SHOWER GEL:

Packaged in a uniquely designed Tube-on-a-Rope, this rich, Gel formula is also available in the six essential oil blends as mentioned under "Bath Bubbles".

BATH OIL:

Available in two sizes 125ml and 250ml, this Bath oil contains a combination of Cold-pressed Sweet Almond and Grapeseed oils. Can be fragranced with your own choice of perfume at no extra charge.

BATH SALTS:

Available in two sizes, 140ml and 280ml, with 10 different colours and fragrances to choose from:

APPLE	Green
STRAWBERRY	Red
JASMINE	White
ORANGE	Orange
DELPHI	Blue
CLOUD NINE	Pink
CONTRABAND	Yellow
BALTHAZAR	Purple
OCEAN MIST	Blue
RAIN FOREST	Green

HAND AND BODY LOTION:

A light, easily absorbed moisturising lotion containing pure essential oils of Rose, Jasmine, Geranium and Sandalwood. Ideal for use on hands and face and body to lightly moisturise normal to dry skin. Available in two sizes 125ml and 250ml.

MOISTURISING LOTION:

A light, moisturising lotion for all skin types. Contains pure essential oils of Rose, Lemon and Neroli. Ideal for use on face, hands and body. Available in two sizes 125ml and 250ml.

ESSENTIAL OIL FLOWER WATERS:

Four different types of Floral waters containing pure essential oil and no synthetic fragrance. Available in two sizes 50ml and 100ml glass bottles.

ROSE	For dry, mature skin
CHAMOMILE	For sensitive, normal to dry skin
LAVENDER	Dry, sensitive skin
ORANGE BLOSSOM	For all skin types, dry and oily

CLEAR SKIN BALM:

A balm with a combination of Lemon, Tea tree and Lavender pure essential oils in an antiseptic base to treat spots, acne, and Tinea. Available in 15gm pots. For best results apply to the affected area.

LIP BALMS:

Lip Balms with a Sun Protection Factor of 5, come in 25gm pots and four flavours, that contain only pure essential oils, and no synthetic fragrance.

LEMON ROSE
PEPPERMINT ORANGE/TANGERINE

EYE GEL:

Glass pots of cool clear gel containing pure essential oil of Chamomile. Very cooling and refreshing and safe to use around the whole of the eye area. Excellent for a refreshing pick-me-up when travelling or at any time of the day or night.

JET-LAG KIT:

A convenient pack of two Aromatherapy oil blends. One refreshing 'Awake' blend to stimulate and a relaxing 'Asleep' blend to help induce sleep. Contains one weeks supply.

TRAVEL PACK:

A convenient pack containing a refreshing and stimulating Bath oil with pure essential oils of Pine, Lemongrass and Rosemary, to refresh after a long journey, and a soothing massage oil to relax, containing pure essential oils of Lavender, Geranium, Sandalwood and Orange.

AROMATHERAPY D.I.Y. KIT:

A complete kit for home use. Containing 20ml bottles of the following pure essential oils; Lavender, Eucalyptus, Peppermint, Geranium and Rosemary. Two x 100ml bottles of Carrier oil – Grapeseed and Sweet Almond oil plus two x 25ml mixer bottles and instructions on how to mix and use the oils for use in the home.

OIL BURNER FRAGRANCE BLENDS:

Pre-mixed essential oil blends to cover most requirements in the home. Can be used straight from the bottle, place 6-8 drops in the Oil Burner bowl of boiling water, and light the candle underneath. Can also be used on a ceramic Lamp Ring or in the Bath. These blends are concentrates and are not diluted with carrier oils.

SENSUAL OIL: Jasmine, Patchouli, Grapefruit
ENERGY OIL: Black Pepper, Patchouli, Peppermint, Ginger, Orange
CONCENTRATION STUDY OIL: Basil, Rosemary, Lemon
CELEBRATION OIL: Clary-sage, Lemon, Ylang-Ylang
LUXURY OIL: Rose, Jasmine, Geranium, Sandalwood
CLARITY OIL: Neroli, Lemon, Rose

FRAGRANCE OILS:

A selection of oils for use around the home, to refresh Pot-pourri, place on a Lamp Ring or to use in an Oil Burner.

APPLE	CONTRABAND
STRAWBERRY	BALTHAZAR
ORANGE	CHRISTMAS PINE
JASMINE	RAIN FOREST
DELPHI	OCEAN BLOSSOM
CLOUD NINE	ROSE

ESSENTIAL OIL PERFUME BALMS:

A selection of four clear balms fragranced with pure essential oils. Apply as you would a perfume, on pulse points for a lasting, lingering fragrance with no synthetic additives

- NEROLI, LEMON, ROSE
- JASMINE, PATCHOULI, GRAPEFRUIT
- ROSE, JASMINE, GERANIUM, SANDALWOOD
- FRANKINCENSE, SANDALWOOD, GERANIUM, ROSE

EAU DE TOILETTE:

We have made our two most popular fragrances, **PILLOW TALK** and **FALLEN ANGEL**, now available in Eau de Toilette. They come in 100ml size bottles using an atomiser.

PRODUCTS FOR MEN:

SHAVING CREAM:

Two Shaving Creams are available. One using the ever popular fragrance of 'SAVAGE'. The other for more sensitive skin, contains pure essential oils of Lavender and Chamomile. Both have a rich, creamy base that delivers a thick lather every time to make shaving an enjoyable experience.

SPLASH ON COLOGNE:

A refreshing Splash on cologne to complete the routine of shaving. Slightly astringent and available in the two most popular Men's Fragrances of 'SAVAGE' and 'BROGUE'. Available in 100ml glass bottles.

SOAP FOR MEN:

Continuing the fragrances of 'SAVAGE' and 'BROGUE', two 100gm vegetable soaps help compliment the Men's range. With a thick, creamy lather, these are ideal for use in the bath, shower or handbasin.

CONCENTRATED PERFUME OILS:

A wide range of perfume oils are available in 15ml Cobalt blue glass bottles.

ANARCHY	INDISCRETION
BALTHAZAR	JASMINE
BROGUE	MUSK
CONFUSIOUS	PILLOW TALK
CONTRABAND	POLLYANDER
CHEMISE	PATCHOULI
CLOUD NINE	ROSE
CHATTERLEY	SAVAGE
DEBUTANTE	SERENDIPITY
DELPHI	S.W.A.L.K.
ENGLISH COUNTRY GARDEN	STRAWBERRY
FALLEN ANGEL	SANDALWOOD

SUNDRY ITEMS:

There is a very wide range of sundry items available for Bath and Shower, Loofah products and Body Brushes, Sisal products, Sponges, Wooden Bathroom Sets, soap dishes, Shaving sets for travelling, luxury Shaving sets, Razors, Shaving Brushes, Soap holders, Cotton Face cloths, High Quality Bath Robes, Incense, Perfumed candles, Floating perfumed candles, Amphora Pots, Ceramic Lamp Rings, Oil Burners, A wide selection of Wooden Massage Products, Foot Rollers, Body Massagers, Battery operated Massagers, and many more products.

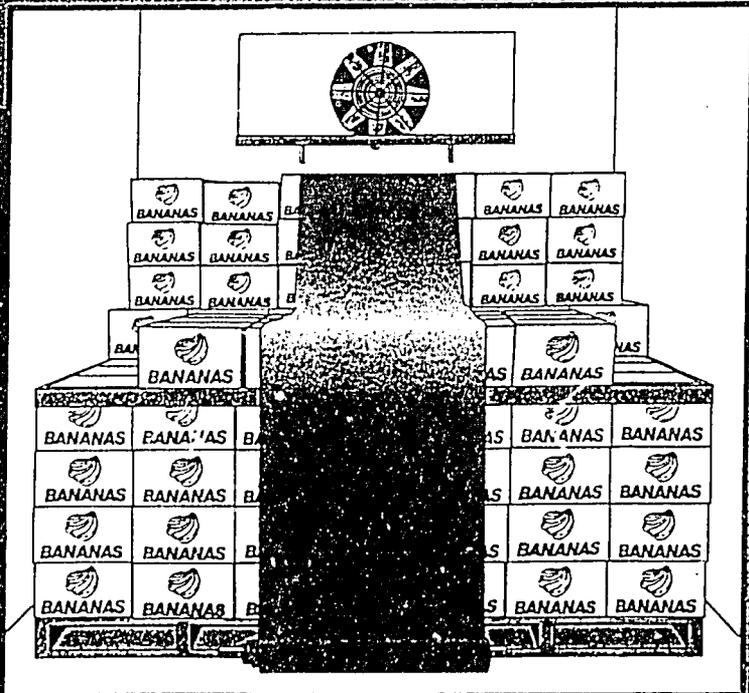
Novelty Gift lines are introduced on a regular basis to ensure that variety, excitement and new ideas are available to the customer.



Queensland Department of Primary Industries
Information Series: Q188027

FORCED-AIR COOLING

Second edition



ISSN 0727-623

AGDEX 200: 53

First published in 1985

Second edition, revised and expanded, published 1990

National Library of Australia Cataloguing-in-Publication Data:

Watkins, J. B. (John B.)

Forced-air cooling
2nd ed., rev. and expanded.
ISBN 0 7242 2579 X.

1. Fruit — Cooling. 2. Vegetables — Cooling. I. Ledger, Scott. II. Queensland. Dept. of Primary Industries. III. Title. (Series: Queensland Department of Primary Industries information series; Q188027).

664'.85

Keyboarding by Judy Frew and Jenny Vincent
Page makeup by Judy Frew, Jenny Vincent and Julie Burnett
Illustrations on pp. 48 to 56 by Julie Burnett
Cover design by Lindy Brennan

© Queensland Government 1990

Queensland Department of Primary Industries
GPO Box 46
Brisbane 4001

Cover illustration

Forced-air cooling: tunnel cooling method.
A row of pallets is placed on each
side of an air channel which opens into
a plenum.

CONTENTS

Preface	v
Introduction	1
Features of forced air cooling	2
Moisture condensation	2
Speed of cooling	2
Measuring the performance of a cooler	2
Resistance to air flow	3
Containers for forced-air cooling	4
Placement of stacks	5
Design of forced-air coolers	12
Essential information and requirements	12
Calculating total refrigeration load for forced-air coolers	15
Compressor selection for forced-air cooling	18
FDC selection for forced-air cooling	18
Fan motor heat load	20
Auxiliary fan selection	20
Return and supply air channels	21
Insulation	22
Forced-air cooling data	24
How to use the graphical data	24
Data	25
Avocado	26
Bean	27
Broccoli	28
Brussels sprout	29
Capsicum	30
Celery	31
Cucumber	32
Lettuce	33
Lychee	34
Mushroom	35
Peach	36
Rockmelon	37
Strawberry	38
Sweet corn	39
Tomato	40
Zucchini	41
Appendixes	42
1 Package weights for fruit and vegetables	42
2 Recommended temperature and relative humidity for storage of fruit and vegetables	44
3 Examples of coolroom designs	47

INTRODUCTION

The first commercial forced-air cooler, built in California in 1955, was used for cooling grapes destined for Florida markets. Since then the technique has grown to be the principle method of cooling horticultural produce consigned from California.

Produce can be air cooled rapidly by producing a difference in air pressure between opposite faces of stacks of vented containers (cartons, cases or bulk bins). This pressure difference forces air through the stacks, past the produce inside. Contact between the

rapidly moving cold air and the produce removes heat rapidly.

Traditional *room cooling*, where air flow is mainly past the outside container walls with little air flow through the container, gives slower and uneven cooling. Produce is cooled mainly by slow heat conduction through the container walls and by random air movements within the container. Highly perishable produce may deteriorate during slow room cooling.

PREFACE

This publication has been written as a guide for people concerned with the principles of forced-air cooling and design of forced-air coolers.

The need for temperature management in the marketing of fresh produce is acknowledged by the enormous increase in on-farm cooling, refrigerated transport and cool storage at the terminal markets. Although there are several cooling methods available for precooling fresh produce — room cooling, forced-air cooling, hydrocooling, package icing and vacuum cooling — the main method used is forced-air cooling. This cooling technique has been actively promoted to the fruit and vegetable industry and the refrigeration industry over the last ten years by the Queensland Department of Primary Industries.

During the early stages in the development of forced-air cooling, it became apparent that the criteria used by the refrigeration industry for selecting refrigeration equipment for fresh produce coolrooms was not always adequate, particularly for produce requiring high humidity. For a given refrigeration capacity, the humidity level in a coolroom is largely dependent on the forced draught cooler (FDC) unit. All too often, either cost considerations or ignorance have been responsible for the selection of an undersized FDC unit resulting in a too-low room humidity. The section 'FDC selection for forced-air cooling' discusses the criteria recommended for selection of a suitable FDC unit.

Forced-air cooling calls for a high peak-load refrigeration capacity. Calculating this load is discussed on pp. 15 to 18. The optimum use of this capacity in forced-air cooling can be realised when coupled with a forced-air cooling flow rate some 30% in excess of the rates given by the data in the final chapter. This is because the calculated refrigeration load will initially limit the rate of cooling, but as the demand for refrigeration drops as the produce cools, the increased flow rate will compensate for the initial lag. Optimising available refrigeration capacity in this way reduces the capital cost of a considerably larger installation, which would be required to avoid any initial lag in cooling.

It is important that allowances be made for adequate condensing capacity to deal with elevated suction temperatures during the early stages of cooling when the demand for refrigeration is greatest.

Although the preceding discussion is the concern of the refrigeration firm, room size, layout and details of materials handling are decisions for the client. These decisions must be made first. The guiding principles used are discussed in 'Placement of stacks' (pp. 5) and 'Essential information and requirements' (pp. 12 to 15).

A successful end result is the product of effective three-way communication between the client, the DPI extension officer and the refrigeration firm concerned.

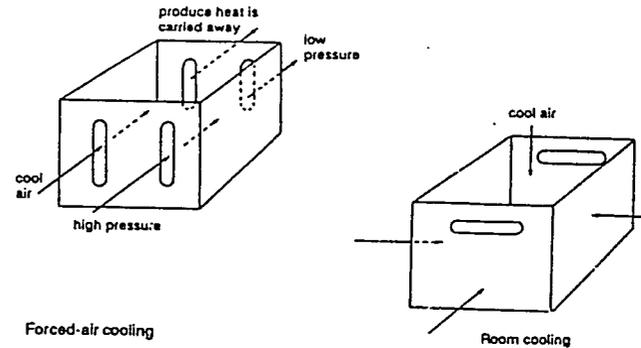


Figure 1 Cooling methods. Room cooling is slow cooling in which the outside of the container is exposed to cool air. Heat is exchanged between the cool container and the produce inside. In palletised loads, the number of walls exposed to cool air will only be three at the most. Forced-air cooling is fast cooling in which cool air is forced through the container. Heat is exchanged between the cool air and the produce.

FEATURES OF FORCED-AIR COOLING

Moisture condensation

When fruits and vegetables are being *room cooled*, produce lying against the container wall is the first to cool while produce in the centre of the container takes considerably longer to cool. Warm, moist air from the warmer central produce can be carried by convection within the container to meet the colder walls and colder produce against the walls. Moisture will condense on this produce and on the walls.

If the container is a fibreboard carton, this condensation will weaken the walls. Condensed moisture on produce may aggravate mould problems.

During forced-air cooling, positive air movement is always from cold produce to warmer produce, *r.e.v.e.r.s.e.* Moisture cannot condense under these conditions.

Speed of cooling

During forced-air cooling, the rate of cooling depends on the rate of air flow past the produce; the faster the air flow, the faster the cooling, providing there is sufficient refrigeration capacity. In designing a forced-air cooler, sufficient refrigeration capacity must be provided to achieve the desired cooling time. An auxiliary fan is generally used to pull air through the produce.

Air quantity is expressed as litres per second per kilogram of produce (L/s/kg). (The imperial unit is cubic feet per minute per pound (cf/m/lb). These terms are virtually interchangeable as L/s/kg approximately equals cf/m/lb.)

A given air quantity does not achieve the same cooling rate for all produce. Small, lightweight, large surface area to volume commodities such as mushrooms will cool much faster than large, dense, low surface area to volume commodities such as rockmelons. As an example, a flow rate of 2.0 L/s/kg will cool mushrooms in less than one hour. Large rockmelons will take 6.5 hours to cool at the same air quantity.

Measuring the performance of a cooler

The performance of any cooling operation is best expressed in 'half cooling time'. This is the time taken for produce to cool down to half the difference between the initial pulp temperature and the set room temperature.

Suppose the average pulp temperature of produce to be cooled is 30°C and it is loaded into a room set at 4°C.

The initial temperature difference will be
 $30^{\circ}\text{C} - 4^{\circ}\text{C} = 26^{\circ}\text{C}$.

Half the difference is 13°C.

The half cooling time (call it *y* hours) will be the time taken for the produce temperature to drop by 13°C. When half cooled, the produce temperature will be:

$30^{\circ}\text{C} - 13^{\circ}\text{C} = 17^{\circ}\text{C}$.

The remaining temperature difference is:

$17^{\circ}\text{C} - 4^{\circ}\text{C} = 13^{\circ}\text{C}$

Half this difference is 6.5°C.

In an additional time interval of *y* hours, the temperature will drop by a further 6.5°C.

The pulp temperature will now be:

$17^{\circ}\text{C} - 6.5^{\circ}\text{C} = 10.5^{\circ}\text{C}$

The produce is now three-quarters cooled — the pulp temperature has dropped by three-quarters of the difference between the initial pulp and set room temperatures.

The remaining temperature difference is:

$10.5^{\circ}\text{C} - 4^{\circ}\text{C} = 6.5^{\circ}\text{C}$

Half this difference is 3.25°C.

In a third time interval of *y* hours, the temperature will drop by a further 3.25°C. The pulp temperature will now be:

$10.5^{\circ}\text{C} - 3.25^{\circ}\text{C} = 7.25^{\circ}\text{C}$

The produce is now seven-eighths cooled. The time taken to reach this temperature is three half cooling times, namely $3 \times y$ hours.

A typical cooling curve is shown in Figure 2, (p. 3), where the half cooling time is 3 hours. The seven-eighths cooling time will be $3 \times 3 = 9$ hours. Cooling times quoted in this publication are seven-eighths cooling times.

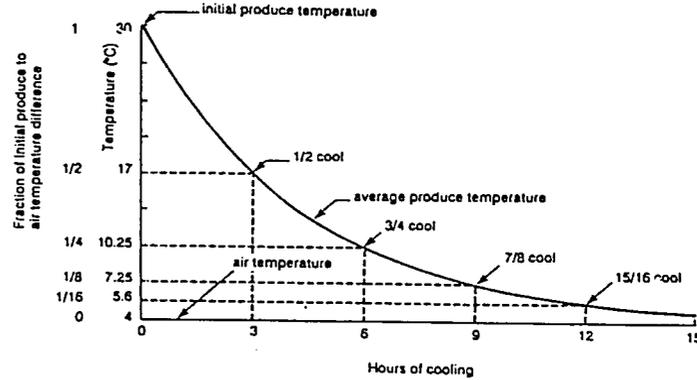


Figure 2 Cooling curve needed to achieve seven-eighths cooling in 9 hours.

As cooling proceeds, the cooling rate is obviously slowing down. As the product approaches the set room temperature, further time intervals give little result. For a forced-air cooling operation, the seven-eighths cooling time is readily achievable in a reasonable time and further cooling becomes less economic.

When packages are being cooled in line, commonly two or three across a pallet, the published cooling times are for produce in downstream packages where the air leaves the stacks. Produce in upstream packages where cold air enters the stacks will cool to virtually air temperature in a much shorter time. For this reason, the entering air temperature must not be below the freezing point of the produce. This may occur in a room set to operate at 0°C (return air temperature), particularly if the cooling coil is undersized (the smaller the coil for a given compressor, the greater is the air temperature drop as air flows through the coil). The thermostat should be set to a point where air leaving the coil does not fall below -1°C.

Freezing does not occur in forced-air coolers equipped with a refrigeration system that uses cold water as the cooling medium for the room air.

Resistance to air flow

Air flowing through produce packages or bins meets some resistance. The total resistance depends on the air flow rate, the number of packages in line across a stack and the nature of the produce.

This resistance, which must be overcome to force a given quantity of air through a stack, is termed 'static head' and is expressed as millimetres of water. The outer face of a stack (upstream) where the air enters is at higher pressure than the inner face (downstream) where the air leaves. This pressure difference is the static head. It can range from less than 1 mm of water in comparatively slow cooling of one-package-wide stacks to 60 to 70 mm in fast cooling of tightly packed produce in palletised stacks three packages wide.

A low air quantity through stacks only one package wide meets very little resistance. As an example, a flow-rate of 2.3 L/s/kg through a 2 L carton of mushrooms with two end vents (45 mm × 15 mm) in the carton produces a static head of only 1.2 mm. As the air quantity increases, the static head rises considerably. At 5.7 L/s/kg through the same carton, the static head is 15 mm. A 2.5 times increase in air

quantity has increased the static head 12.5 times.

A similar effect on static head occurs when the number of cartons in line across the width of a stack increases. A flow rate of 2.3 L/s/kg through stacks of mushrooms one carton wide produces a static head of 1.2 mm. The same flow rate through stacks two cartons wide produces a static head of approximately 15 mm. For three-carton-wide stacks, the static head rises to 55 mm.

High air flow rates through stacks several cartons wide will obviously meet with very high resistance. Expensive, powerful fans are needed to overcome this resistance.

Additional heat generated by such fans can be considerable. For example, a fan capable of working against a 55 mm head requires a seven to nine times increase in power over one moving the same air quantity against a 2.5 mm static head.

In designing a forced-air cooler, any benefits attributed to fast cooling against slower cooling must be balanced against initial capital cost and running costs of the required refrigeration capacity and fan power.

Containers for forced-air cooling

Any type of container ventilated to admit air can be forced-air cooled when stacked in tiers one container wide. For stacks more than one container wide, vents have to align to allow air to flow through successive containers across the stack.

Palletised produce is made up of stacks commonly two or three containers wide. The Australian United Fresh Fruit and Vegetable Association series of rationalised packages includes end-vented cartons which are column-stacked in register in 6/layer (3 wide x 2 deep) or 12/layer (4 wide x 3 deep) units. The aligned vents allow air to flow through the palletised cartons.

Recently developed cartons include 8/layer cartons and trays vented for forced-air cooling of cross-stacked palletised cartons. The trays have two end vents and three side vents. Foam polystyrene containers and returnable crates have ventilation patterns which allow

forced-air cooling in either column stacks or cross stacks (see 'Container vents' below).

Suitable bulk bin ventilation depends on the type of cooling used (see p. 5 'Placement of stacks'). Solid ends with side venting and the pallet rails running parallel to the vented side are suitable for forced-air cooling of paired parallel rows separated by a return air channel. Bins vented on all sides can also be used.

For serpentine cooling, only the bin floor needs to be vented (see p. 5 'Placement of stacks').

Container vents

In volume fill packages, used for larger fruits and most vegetables, the main resistance to air flow occurs at the container vents. The total area for air paths within the container far exceeds the vent area.

Total vent area should be at least 4% of the area of the vented face. Increasing the area is beneficial up to the point where package strength begins to suffer.

Small, densely packed commodities such as grapes, or commodities which can almost block vents entirely – for example sweet corn packed across the vents and lettuce tightly packed – can offer considerable added resistance to air flow. This resistance can be reduced by including vents along the top edge of the vented face. Slight settling of produce can allow air to sheet across the top, lowering the resistance and creating turbulence within the container. Turbulent air flow is effective in removing heat.

Elongated vents are preferable to round holes. Holes are too easily blocked by round produce. Slots should be as wide as possible within the limits of desired package strength. Wide slots minimise the reduction of effective vent area occurring if packages are misaligned across a stack more than one package wide.

Cartons provided with interlocking facilities are ideal for forced-air cooling; interlocking prevents misalignment during stacking.

Where horizontal slots are along the top edge of a package, the package should also have base venting or venting along the bottom edge. Open-top polystyrene packages are vented in this way, with the vents along the top edge, bottom edge and in the base. Returnable crates have top edge and base venting.

Placement of stacks

Figures 3 to 6 show methods of stack placement for forced-air cooling.

In Figures 3 and 4, paired parallel rows of containers – stacked in single container width tiers, multiple width tiers or palletised – are separated by a covered return air channel. This method is called tunnel cooling.

Coolroom air is pulled through the stacks into the return channel by an auxiliary fan which discharges air either via a plenum (Figure 3) or directly into the coolroom air (Figure 4). The plenum is simply a chamber which houses the auxiliary fan and enables a more direct return of warm air to the cooling units above. Small plenums can be built as movable units. Larger plenums are generally fixed.

The FDC unit can be used instead of an auxiliary fan to move air through the containers where total air quantity required approximates the flow rate of the FDC and static heads are low (0 to 7.5 mm). Figure 5 shows that a partial plenum is formed by fixing two vertical panels, floor to ceiling, from the FDC unit to the back wall. The full plenum is formed when the paired parallel rows of containers are placed into position. A high static head with this design will unduly reduce the flow rate through the FDC, reducing the refrigeration capacity and lowering room humidity.

Figure 6 shows the system where air flow through the stacks is discharged directly into the plenum. This is called cold wall cooling. It eliminates the need for supply and return air channels but limits the cooling area to a one-deep pallet line across one end or along one side of the coolroom. This system is well suited to cooling a limited odd or even number of pallets.

The system shown in Figures 3 to 6 can be used for cooling produce in side-vented bulk

bins. Figure 7 shows the system called 'serpentine cooling', used for cooling produce in bins having floor ventilation. The bins are block stacked one behind the other and one above the other against a plenum. Alternate air channels formed by the bin rails become supply and return channels. Supply channels are closed at the plenum end by the plenum wall but are open at the opposite (outer) end. Conversely, return air channels are closed off at the outer end but open into the plenum. The outer end is closed with a canvas strip held in place by elastic straps. Coolroom air enters the supply channels and flows upwards through the bin above and downwards through the bin below to enter the plenum via the return channels.

The Victorian Department of Agriculture has developed a serpentine system using a large movable plenum placed centrally across an existing coolroom. The plenum is moved into place after the bins have been stacked. One or more auxiliary fans mounted on top of the chamber pulls air through the bins to discharge it into the cold air stream above (Figure 8).

Return air channel cover

The cover (blind) over the return air channel (Figures 3, 4, 5) is typically made from sarlon or canvas reinforced at about 0.5 m intervals with metal or timber battens sliding into pockets across the width of the cover. This prevents the cover collapsing into the channel. The minimum cover length equals the maximum length of the channel plus the height of the stacks. The cover can be fixed to a roller on the plenum face above the return air opening and rolled up when not in use. Alternatively, the unattached cover is simply rolled up. The cover is either pulled or rolled backwards to cover the channel.

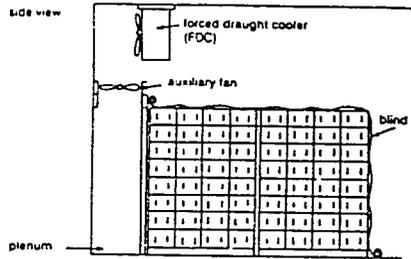
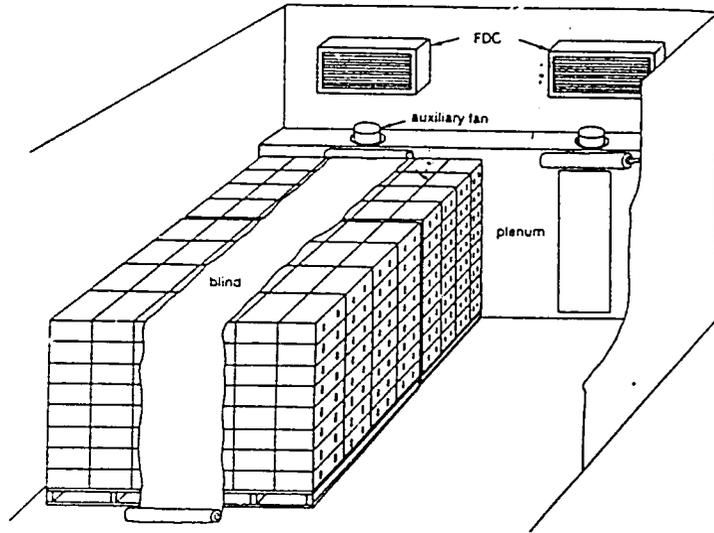


Figure 2 Tunnel cooling. This design is suitable for cooling even numbers of bulk bins, pallet loads of containers or floor-stacked containers. A row of pallets (or bins or containers) is placed on each side of an air channel which opens into a plenum. The same number of pallets must be placed in each row. A reinforced blind is run over and down the end of the air channel. Air is pulled through the containers into the air channel and back through the plenum and auxiliary fan to the forced draught cooler (FDC). The plenum can have a number of openings which must be closed when not in use. When bulk bins are being cooled, the top bins must be covered either separately or by a full-width blind.

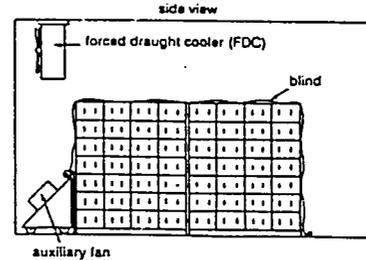
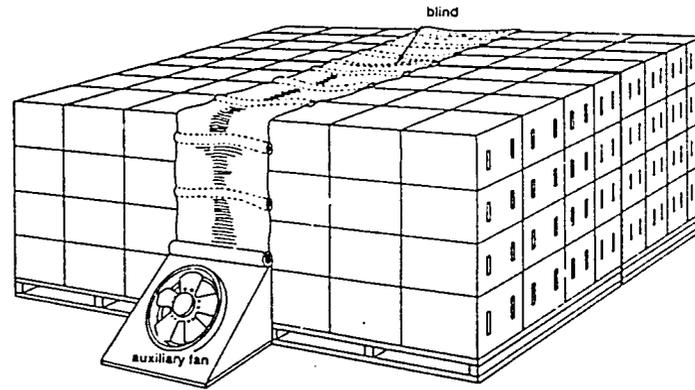


Figure 4 Tunnel cooling. Portable systems can be designed by mounting the auxiliary fan in a mobile box. Two rows of pallets (or bulk bins or floor-stacked containers) are placed against the portable fan with an air channel between the rows. A reinforced blind is run over and down the end of the air channel. The fan should be angled to direct warm air back to the FDC.

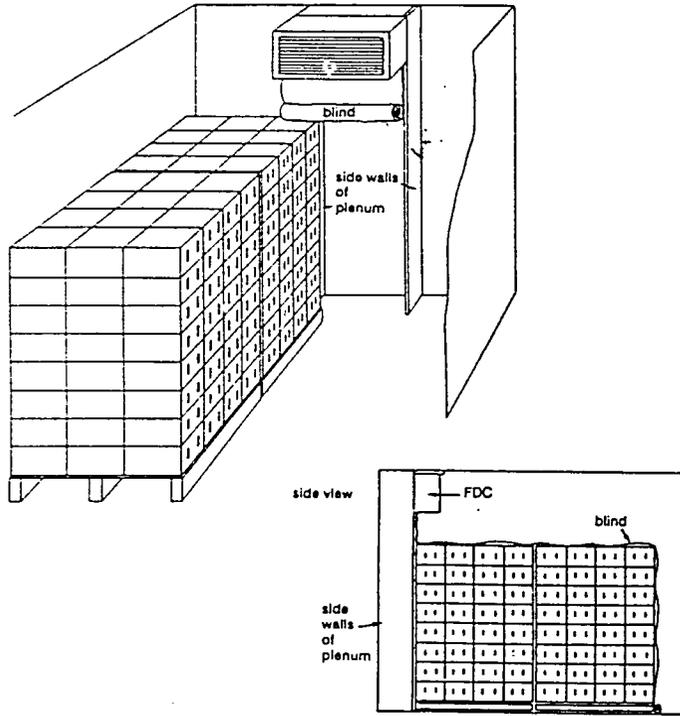


Figure 5 Tunnel cooling using FDC fans. This design features a partial plenum without an auxiliary fan. The plenum is formed by fixing two vertical panels, floor to ceiling, from the FDC to the back wall. The full plenum is formed when two pallet rows (or bulk bins, or floor-stacked containers) are placed into position with an air channel between the rows. The space between the top of the pallet and bottom of the FDC is closed with a full-width blind. The blind allows for varying pallet heights. Air is pulled through the containers into the air channel, then back through the plenum to the FDC. The disadvantage of this design is that all the room air flows through the containers. This reduces air flow through the FDC, which reduces room humidity and refrigeration capacity. This design has been used successfully for forced-air ripening of bananas and cooling of rockmelons.

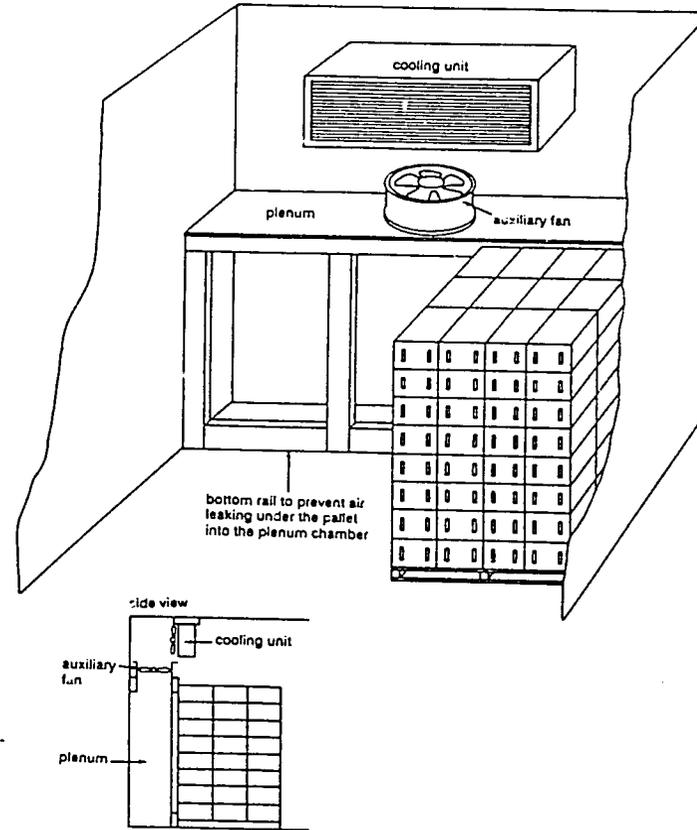


Figure 6 Cold wall cooling. In this design, the pallets (or bulk bins, or floor-stacked containers) are placed against openings of similar width in the plenum. The openings must be closed if not in use. Air is pulled through the containers into the plenum and back through the auxiliary fan to the FDC. The design is suitable for cooling odd numbers of pallets. The pallets should only be one deep against the plenum. Small numbers of containers (less than a pallet load) can be cooled with this design by stacking on the floor or on a trolley (for example strawberries).

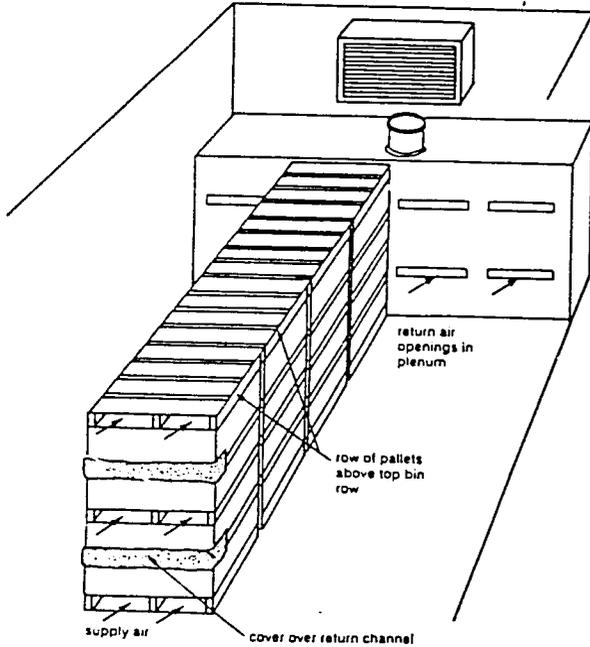


Figure 7 Serpentine cooling. Alternate channels formed by the bin rails are supply and return air channels. Air entering supply channels flows up through the bin above and down through the bin below. Return channels open into the plenum; the opposite ends are covered with canvas or sarion straps. A row of pallets is placed on the top bin row and covered with a canvas or sarion blind to prevent air entering between the pallet boards. This pallet row forms a supply channel for the top bin row.

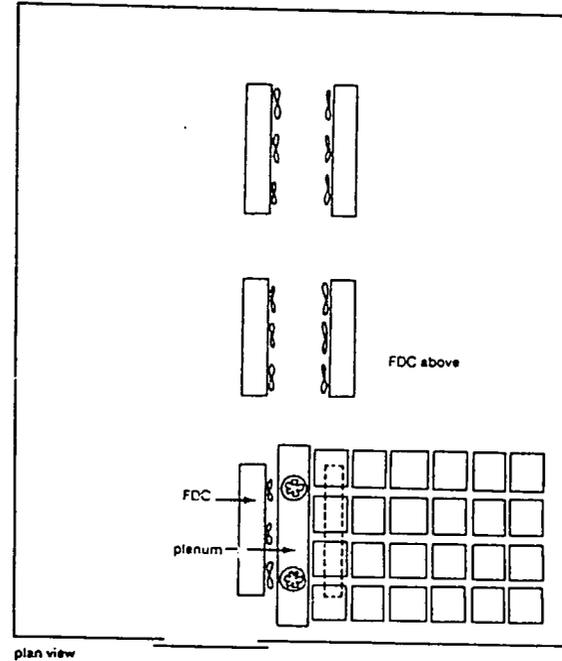


Figure 8 Serpentine cooling using a portable plenum – plan view. This system is used in Victoria for cooling pears in large coolrooms equipped with several back-to-back FDC units on either side of the ceiling ridge. Bins stacked for cooling are typically 6 bins long, 4 bins wide and 5 bins high. The plenum is moved into place after the bin stacks have been positioned.

DESIGN OF FORCED-AIR COOLERS

The following section gives the essential information needed to design a forced-air cooler. Given this information, calculation of room size, product layout within the room, auxiliary fan size and refrigeration capacity is not a difficult exercise. What can prove difficult is to initially gather the required information from the prospective client, typically a grower plagued by uncertainties of his or her own requirements.

Essential information and requirements

Types of product or products

Is the cooler for one commodity only or more than one – for example, tomatoes only or tomatoes and lettuce? Lettuce requires high humidity, tomatoes do not. The type of product affects the selection of refrigeration equipment, notably the selection of the forced draught cooler (FDC), the cooling unit in the room.

Produce weight and volume

This is required for determining room size, refrigeration capacity and auxiliary fan requirements.

Type of container and method of stacking

Are the containers to be bulk bins or package units? Are the packages to be hand stacked or palletised? If bins, is the cooling system to be paired parallel rows or serpentine cooling? If palletised, are the pallets in paired parallel rows or directly against a plenum?

This information is required for determining room size, product placement, plenum design and static head rating for the auxiliary fan.

Cooling time

The desired cooling time determines the product load on the refrigeration and auxiliary fan requirements (flow rate and static head). This in turn determines the dimensions of supply and return air channels, a factor in calculating room size (see p. 20 'Auxiliary fan selection').

Forklift, reach truck or pallet jack

When handling palletised units, allow at least 4.3 m for turning a forklift, 2.7 m for a reach truck and 1.8 m for a pallet jack (see also p. 13 'Location and size of doorways').

Stack height

The stack height plus the depth of the FDC unit determines internal height when using the system shown in Figure 4. For the system in Figure 3, additional height may be needed to allow for the depth of the fan casing if an axial flow fan is used (see pp. 14 to 15 'Location of the FDC unit').

Cooling only or cooling plus holding

In some coolrooms, produce is cooled daily and then held for one to three days before consigning to market. The design must allow for a holding area in addition to the cooling area.

For produce prone to moisture loss, the cooler must be designed to operate at a high humidity, particularly if exposed produce is to be held in the coolroom after cooling. Typical examples are lettuce, broccoli and sweet corn in open top cartons. Humidity requirements influence the choice of the FDC unit and sometimes the location of the unit (see pp. 14 to 15 'Location of the FDC unit').

Depth of plenum

The depth of the plenum (front to back dimension) must be allowed for in calculating room dimensions, generally room length. The plenum must be of sufficient depth and width to accommodate the fan opening clear of any structural supports. Dimensions for fan mountings are included in fan catalogues.

Location and size of doorways

Doorway location is important in facilitating movement of produce to and from the room and within the room.

Full-room-width doorways can reduce the space needed within a room for handling pallets. If forklifts can enter a room and reverse out along the same path, no space is required within the room for turning. Paired doors, each a little wider than half the room width and one sliding behind the other, can be used where there is no space behind the edge of the room to slide a full-width door. Alternatively, a full-width door may open vertically if there is sufficient clear height above the room.

Although full-width doors reduce room size, the reduced cost of less wall area may be offset by the added cost of a larger door or doors. However the risk of damage to the room is minimised if forklifts can operate on a straight line basis to avoid turning within a room.

Doorways must be wide enough to lessen the risk of damage to door jambs when handling palletised produce through doorways. The cost of foolproof protection to door surrounds can be considerable.

Although a doorway is frequently located centrally in an end wall, doorway location in one corner can often facilitate room loading and allow better use of room space. When one end of a coolroom is used as the cooling area and the opposite end for a holding area, it is convenient to locate the doorway at or towards the centre of one long wall. An aisle running across the width of the room from the doorway to the opposite long wall serves as an area to manoeuvre produce from the cooling to the holding area or to and from either area to the outside (Figure 9).

Doorway heights must be sufficient to allow clearance for a forklift mast.

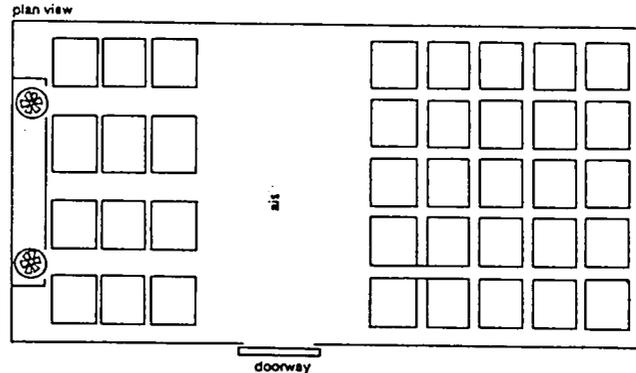


Figure 9 In this design, produce is forced-air cooled at one end of the room and stored at the opposite end. The aisle between must be wide enough to manoeuvre a forklift or pallet jack.

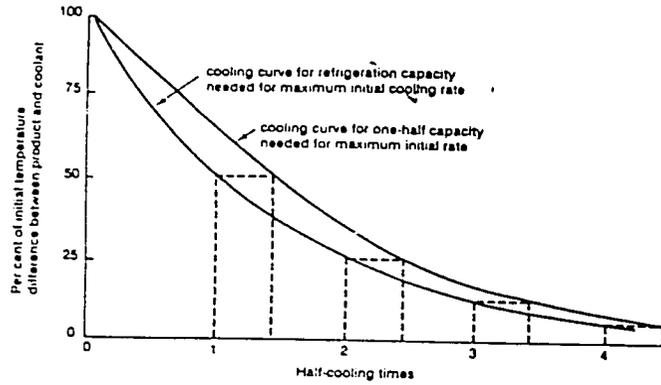


Figure 11 Effect of refrigeration capacity on cooling rate. (Source: University of California, Division of Agricultural Sciences)

This capacity will achieve the desired cooling time using air flow rates approximately 30% greater than given by the graphs at the end of this publication.

Average air changes for a range of room volumes are given in Table 2. Heat removed in cooling the air to room temperature is given in Table 3.

Wall load

Wall load (W) = room surface area (m²) × wall heat gain factor (W/m²)

Wall heat gain factors are listed in Table 1.

Surface area includes all walls, ceiling and floor. Heat loss figures for concrete on dry soil, where the soil temperature is lower than daytime ambient air temperatures, suggest that losses through the floor are about equivalent to losses through 75 mm of polystyrene wall.

Air change load

Air change load (W) = room volume (m³) × average air changes per hour × heat removed in cooling air to room temperature (W/m³)

Example of total refrigeration load calculation

As an example, two pallets of cucumbers are to be cooled in 12 hours with extra space for storage of three pallets.

- Given data:**
 Room dimensions 4.2 m × 4.2 m × 2.8 m
 Insulation 150 mm
 Room temperature 7°C (t_r)
 Ambient temperature 32°C
 Initial product temperature* 32°C (t_i)
 Product weight 2 pallets × 95 ten kg cartons per pallet = 1920 kg
 Cooling time 12 hours

* Initial product temperature will be varied, but product load calculations should be based on the highest possible (continued)

Table 1
Wall heat gain (watts per m² of outside surface)

Insulation thickness Polystyrene or equivalent	Temperature difference in °C between outside ambient and room temperatures					
	1°	15°	20°	25°	35°	
75	0.567	8.5	11.34	14.17	17.0	19.84
100	0.425	6.37	8.5	10.62	12.75	14.87
125	0.340	5.10	6.80	8.50	10.20	11.90
150	0.284	4.26	5.68	7.10	8.52	9.94

Table 2
Average air changes per hour for storage rooms at or above 0°C.

Volume (m ³)	Air changes	Volume (m ³)	Air changes	Volume (m ³)	Air changes
5.5	1.8	22.5	0.83	140	0.3
7.0	1.6	28.5	0.73	170	0.27
8.5	1.4	42.5	0.58	225	0.23
11.5	1.2	56.5	0.5	280	0.2
14.0	1.1	85.0	0.4	425	0.15
17	0.95	113.0	0.34	565	0.14

Table 3
Heat removed in cooling air to coolroom temperature (watts per m³)

Coolroom temperature °C	Temperature of outside air (assume a relative humidity of 60%)			
	30°C	32°C	35°C	38°C
18.3	8.8	12.1	15.9	20.2
15.5	10.6	14.2	18.0	22.2
12.7	13.8	17.2	20.8	25.2
10	15.9	19.3	23.0	27.4
7.2	17.9	21.3	25.0	29.5
4.4	19.8	23.4	27.1	31.7
1.6	21.6	25.1	28.9	33.5
-0.1	23.2	26.2	30.4	34.7

temperature which may occur in the growing area concerned. For tree crops, fruit temperatures generally approximate ambient temperatures, but for vine crops, e.g. rockmelons, pulp temperatures in exposed fruit can be several degrees higher than the daily maximum temperature.

Wall load

Wall load (W) = surface area (m²) × wall heat gain (W/m²)

Area of walls, floor and ceiling = (4.2 × 4.2 × 2) + (4.2 × 2.8 × 2) + (4.2 × 2.8 × 2) = 35.28 + 23.52 + 23.52 = 82.32 m²
 Ambient temperature minus room temperature = 25°C.
 Wall heat gain for 25°C difference and 150 mm insulation (Table 1) = 0.284 × 25 = 7.10 (W/m²)
 Wall load = 82.32 × 7.1 = 584.5 watts

Air change load

Air change load (watts)
= room volume (m³) × air changes per hour × heat removed in cooling air (watts/m³)

$$\text{Room volume} = 4.2 \times 4.2 \times 2.8 \text{ m}^3 = 49.39 \text{ m}^3$$

Air changes for 49.39 m³ (Table 2) = 0.54 approx.

(This is estimated from 0.58 for 42.5 m³ and 0.5 for 56.5 m³.)

From Table 3, heat removed in cooling air from 32°C to 7°C is 21.3 watts.

$$\text{Air change load} = 49.39 \times 0.54 \times 21.3 = 568 \text{ W}$$

Product load

$$\text{Product load (W)} = \frac{\text{product weight (kg)} \times (t_1 - t_2) \times 1.29}{\text{cooling time (h)}}$$

Product weight = 1920 kg
t₁ - t₂ = 25°C

Cooling time = 12 hours

$$\text{Product load} = \frac{1920 \times 25 \times 1.29}{12} = 5160 \text{ W}$$

Total refrigeration load

$$\begin{aligned} \text{Total refrigeration load} &= \text{wall load} + \text{air change load} \\ &+ \text{product load} \\ &= 584.5 + 568 + 5160 \text{ W} \\ &= 6312.5 \text{ W} \end{aligned}$$

Compressor selection for forced-air cooling

Many forced-air coolers are used for dual purposes – cooling and short-term holding. The difference in refrigeration capacity required for each role can be considerable; far more capacity is needed for peak load cooling than for holding.

In large forced-air coolers where the total peak load capacity requires two or more FDC units, a separate compressor can be coupled to each unit. Once the product has cooled, one or

more compressors can be shut down during holding. This reduces capacity but does not alter room humidity.

A more flexible system is to couple two similar compressors to each FDC unit, provided that the compressors are designed for this application. After cooling, one compressor can be shut down. This reduces capacity and raises room humidity, a distinct advantage while holding produce at a set storage temperature. This applies in particular to produce which is prone to moisture loss and is held in open-top packages.

FDC selection for forced-air cooling

The traditional method used by the refrigeration trade for selecting equipment for fresh produce cool stores has been to design for a 5.5°C temperature differential between air onto the coil and refrigerant temperature within the coil (suction temperature). While this may be acceptable for some applications, it can be unacceptable for produce requiring high-humidity cool storage.

Room humidity is determined not only by the temperature differential but also by the quantity of air moving through the coil. Two coils operating at the same temperature differential but differing appreciably in air quantity will give different results in application.

A better basis for selecting the FDC unit is to design for a desired diffusion temperature through the coil. The diffusion temperature is the difference between the temperatures of the air entering the coil and the air leaving the coil. The less the diffusion temperature, the higher the average humidity in the room.

$$\begin{aligned} \text{Diffusion temperature (°C)} &= \frac{\text{balanced capacity (watts)}}{\text{air quantity (m}^3/\text{h)} \times 0.34} \end{aligned}$$

$$\begin{aligned} \text{The imperial equivalent in } ^\circ\text{F} &= \frac{\text{balanced capacity (Btu/hr)}}{\text{air quantity (cfm)} \times 1.1} \end{aligned}$$

The balanced capacity is the calculated capacity of the refrigeration system at the set room temperature. This is determined by the

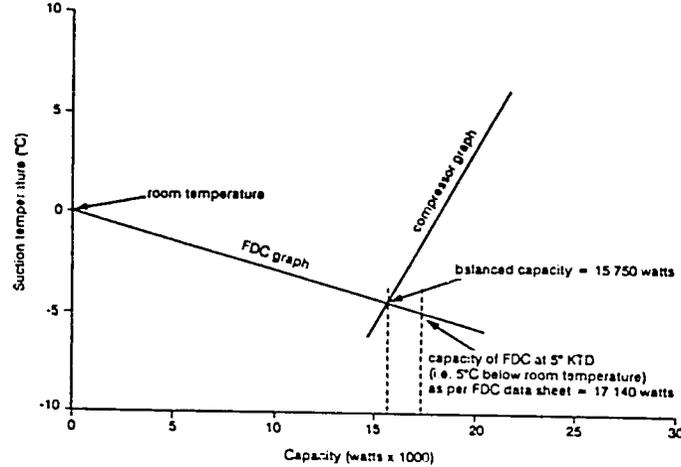


Figure 12 Calculating balanced refrigeration capacity of compressor and FDC.

intersection of the compressor and FDC graphs showing the relationship between temperature and refrigeration capacity (Figure 12).

Compressor and FDC data sheets include data on refrigeration capacity at various temperatures. This data is used to plot the necessary graphs. Compressor capacities at -5°C, 0°C and 5°C suction temperatures are sufficient to establish the compressor graph, which is approximately a straight line through these points. The FDC graph is a straight line originating at zero capacity at the set room temperature and passing through the stated capacity at 5° KTD (5°C below room temperature).

The air quantity used in the diffusion temperature calculation is included in FDC data sheets. If the air quantity is given as litres/second (L/s), then

$$\text{m}^3/\text{h} = \text{L/s} \times 3.6$$

For the example shown in Figure 12, the balanced capacity is 15 750 watts, and the airflow of the FDC unit as per data sheet is 19 029 m³/h.

$$\begin{aligned} \text{Diffusion temperature (°C)} &= \frac{15\,750}{19\,029 \times 0.34} \\ &= 2.4 \end{aligned}$$

Experience with the design and operation of forced-air coolers has confirmed that the diffusion temperatures should not exceed 2.5°C (4.5°F) for produce prone to moisture loss, particularly if the produce is held in short-term storage after cooling. Systems using two compressors per coil, designed for a 2.5°C diffusion, will operate at approximately half this diffusion temperature when one compressor is shut down during storage. Under these conditions, room humidity can be in excess of 95% relative humidity.

Fan motor heat load

Fan motor heat is always included in total heat load calculations when determining total refrigeration load in a room cooling operation. During typical room cooling, room temperature generally does not rise appreciably above the thermostatically controlled room temperature because of limited heat exchange. Any rise which does occur is generally short-lived.

When calculating total heat load for a forced-air operation, fan motor heat can be ignored. Refrigeration equipment for a forced-air cooler is selected to have a balanced capacity at the set room temperature, approximating the capacity needed for the peak demand at the start of cooling. The set room temperature is generally 0°C or 5 to 7°C, depending on the commodity to be cooled. During forced-air cooling, the room temperature rises appreciably at the start of cooling a warm batch and falls comparatively slowly as cooling proceeds, reaching the set room temperature only towards the end of the cooling cycle.

Although this variation in room temperature does not significantly affect the cooling time, it does have a significant effect on compressor capacity. At higher room temperatures and consequently higher suction temperatures, compressor capacity increases, often by up to 20%. This increased capacity is more than enough to offset fan motor heat.

As the product cools and the room temperature falls, the capacity decreases but the demand for refrigeration decreases faster. The excess capacity is once again more than enough to offset fan motor heat as the product progressively cools.

Auxiliary fan selection

The total weight of produce to be cooled multiplied by the flow rate per unit weight for the chosen cooling time determines the total air quantity required. The graphs in the section 'Forced-air cooling data' (pp. 24 to 41) show the relationship between flow rate and cooling time and static head and cooling time.

As an example, to cool 10 tonnes of rockmelons in 10 hours (600 minutes), a flow rate of 1 L/s/kg is needed (see Figure 14). As stated on pp. 15 to 16, in 'Calculating total refrigeration load', this flow rate should be increased by 30%, giving an adjusted flow rate of 1.3 L/s/kg. The total air quantity required will then be:

$$10\,000 \times 1.3 = 13\,000 \text{ L/s} \\ = \text{approx. } 47\,000 \text{ m}^3/\text{h}$$

Fan data catalogues generally specify fan capacity as cubic metres/hour (m³/h). To convert L/s to m³/h, multiply L/s × 3.6.

The static head at 1.3 L/s/kg is about 3.0 mm (see Figure 14).

The final fan selection is based on the fan closest to, but not less than, the required air quantity and static head ratings.

Type of fan

For low to moderate air flow requirements (up to 8 000 m³/h and static heads up to 10 mm) smaller propeller fans can be used. These range in size from 315 mm to 630 mm diameter. At higher air quantities and pressures, axial flow fans are more economical.

Selecting dual purpose fans

A forced-air cooler may be needed for a dual role. For example, a cooler designed primarily for cooling rockmelons in 12 hours may be required at times to cool a smaller quantity of a different commodity, e.g. zucchini, in 3 to 4 hours. This is generally the situation in transport depots cooling a variety of commodities for transport.

Although the total air quantity and refrigeration capacity required for these two different purposes may be reasonably similar, the static head requirement for the zucchini will be much higher because of increased flow rate per unit weight through three carton wide stacks; rockmelon stacks are typically two cartons wide.

The fan selected must be rated for this higher static head. If the total air quantity needed for the alternative commodity is considerably less, the cooler will be better equipped if two fans are installed. Both are used for the high air

requirement; but only one for the lesser quantity.

In designing large forced-air coolers to handle a range of commodities, some compromise may be needed. Using multiple auxiliary fans in a common plenum in conjunction with a number of FDC units, each coupled with independent condensing units, can offer the ultimate in flexibility.

Return and supply air channels

Air passages supplying cold air and returning warmer air must be wide enough to avoid appreciable pressure drops in the channels. A significant pressure drop along the length of a return channel can cause uneven air flow through the produce, resulting in differences in cooling times.

Calculating return channel width

The pressure drop in an air channel is negligible if the air velocity is 150 m/minute (about 500 f/min) or less. This is an ideal condition if passages and openings can be made large enough.

The total air quantity flowing along a passage is the cross-sectional area of the passage multiplied by the air velocity:

$$\text{Total air quantity (m}^3\text{/minute)} \\ = \text{height (m)} \times \text{width (m)} \times \text{velocity (m/min)} \\ \text{Width (m) is then}$$

$$\frac{\text{total air quantity (m}^3\text{/min)}}{\text{height (m)} \times \text{velocity (m/min)}}$$

Assuming an ideal velocity of 150 m/min (= 9 000 m/h) and having calculated the total air quantity required (m³/h) as given on p. 20, the desirable passage width is

$$\text{Width (m)} = \frac{\text{total air quantity (m}^3\text{/h)}}{\text{height (m)} \times 9000}$$

As an example, the air quantity needed for cooling tomatoes in 12 hours is approximately

$$0.42 \text{ L/s/kg} + 30\% = 0.53 \text{ L/s/kg} \\ \text{(from the tomato data graph, p. 40)}$$

Assuming 10 tonnes of fruit, the total air quantity is

Design of forced-air coolers 21

$$10\,000 \times 0.53 = 5300 \text{ L/s} \\ = 19\,000 \text{ m}^3/\text{h}$$

The passage height (= stacked pallet height) is approximately 2.0 metres. The required width is then:

$$\frac{19\,000}{2 \times 9000} = 1 \text{ m (approximately)}$$

For faster cooling or cooling large commodities, such as rockmelons which require considerable air quantities, the ideal passage width may become excessive. Reducing passage width will increase air velocity in the passage at the risk of unequal air flow through produce. Produce near the exit end (plenum end) of the return air channel may receive more air than produce at the opposite end. This is more likely to happen at lower static heads (0 to 12.5 mm) than for higher total static heads.

Calculating supply channel width

From Figure 13, the best ratio of supply channel width to return channel width can be calculated from the ratio of supply channel length to return channel length. Supply and return channel lengths are measured in the direction of air flow. Air flow direction is obvious for return channels but less obvious for supply channels. For paired parallel rows (Figures 3, 4, 5), air enters mainly along the top of the supply channel and flows downwards before turning to enter the stacks. The length of the supply channel would be the height of the stacks.

As an example, if the rows are five pallets long (about 5.8 m), the length of the return channel will be 5.8 m. If the height of the pallets is 1.7 m, the ratio of supply channel length to return channel length will be

$$\frac{1.7}{5.8} = 0.3 \text{ (approximately)}$$

From Figure 13, the supply channel width will also be 0.3 of the return channel width.

For rows two pallets long, the ratio of supply channel length to return channel length would be

$$\frac{1.7}{2.4} = 0.7$$

From Figure 13, the supply width would be 0.55 of the return channel width.

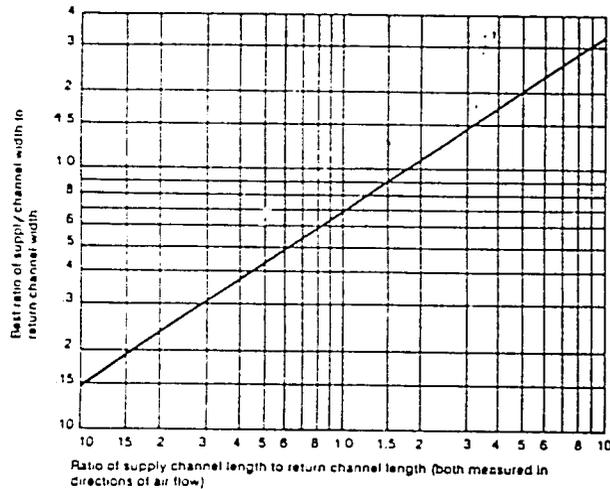


Figure 13 Ratio of air-channel widths for least static-pressure loss, in relation to ratio of air-channel lengths for parallel or cross flow in channels between produce stacks cooled by forced air. (Source: University of California, Division of Agricultural Sciences.)

For adjacent paired parallel rows (Figure 3) the central supply channel should be double the calculated width as this must supply rows on either side, not just one row.

For the system shown in Figure 6, the room serves as the supply channel and the plenum itself forms a generally adequate return channel. This system is used extensively in California. In some forced-air coolers of this type, a second row is carried on a shelf above the row of pallets on the floor, making more effective use of floor space if room height is sufficient. Such coolers are called shelf coolers.

Insulation

Wall insulation

Although 75 mm thick wall panels (typically polystyrene foam insulation bonded to inner and outer aluminium or steel panels) are often used, heavier insulation will eventually pay for itself in reduced running costs, particularly when produce is being held in storage following cooling. The author can cite one example where the initial capital cost of a coolroom was less when the insulation thickness was doubled (75 mm to 150 mm). This apparent contradiction resulted from a reduced refrigeration load, allowing a smaller, less costly compressor to be used. An additional saving was the difference in ceiling support costs — the 75 mm ceiling required

steel supports but the 150 mm ceiling was self-supporting for the room width specified.

Heavier ceiling insulation reduces the heat load on cool air discharged from the cooling unit along the underside of the ceiling. This smaller heat load reduces the temperature rise before the air reaches the product, maintaining a higher relative humidity in the cooling air. This is of more significance in a storage situation following cooling than during the actual cooling process.

Floor insulation

The economics of floor insulation are far more debatable than for wall insulation. A non-insulated floor is typically a concrete slab laid directly on the ground below. As the soil below the floor cools down, the temperature difference between the room air and the soil decreases, reducing heat loss into the soil. If the soil is kept dry, the soil temperature remains fairly stable after initial cooling.

To keep the soil dry, the vapour barrier generally laid under concrete slab floors should

be omitted. The absence of a barrier allows water vapour in the soil to move through the concrete into the room. This does no harm and can be of some benefit in raising room humidity.

If a vapour barrier is included under the floor, this barrier becomes colder than the soil beneath. Water vapour in the soil will condense on the underside of the barrier, wetting the soil below. Dry soil is a more effective insulator than wet soil.

If the water table is less than three metres below the soil surface, floor insulation should be used. A vapour barrier must then be included on the underside of the insulation.

Many produce coolers are built on existing concrete floors in packing sheds. To include floor insulation would raise the coolroom floor level by 150 to 175 mm (75 mm insulation plus 75 to 100 mm of concrete) above the surrounding shed floor. This necessitates a ramp outside the coolroom door, a considerable inconvenience in moving produce to and from the coolroom.

FORCED-AIR COOLING DATA

The following graphs show the relationship between flow rate, static head and cooling time.

The vertical scale is for flow rate and static head. Flow rate is expressed as litres/second/kilogram (L/s/kg). For all practical purposes, L/s/kg is equal to cubic feet/minute/pound (cfm/lb). The static head is expressed as millimetres of water.

The horizontal scale is cooling time expressed as minutes. The vertical and horizontal scales are logarithmic.

Graph A shows the relationship between flow rate and cooling time. Graph B shows the relationship between static head and cooling time for air flow through a pallet load of containers, except in the case of strawberries and lychees. For these fruit, the static head graph refers to air flow through only one container.

Note that the time scale for sweet corn commences at 100 minutes, not zero as for other commodities.

It should be possible to extrapolate the graphs to determine the requirements for cooling times outside the range shown. This applies in particular to the straight line graphs.

How to use the graphical data

Figure 14 illustrates how to use the graphical data. The example chosen is the one discussed on p. 20 using the rockmelon data.

Step 1

Read off the flow rate corresponding to the chosen cooling time; for example, 1 L/s/kg for cooling rockmelons in 10 hours (600 minutes).

Step 2

Add 30% to this flow rate; for example, 1 L/s/kg + 30% = 1.3 L/s/kg.

Step 3

Read off the static head corresponding to the increased flow rate; for example the static head for a flow rate of 1.3 L/s/kg when cooling rockmelons is 3 mm.

Note that the vertical and horizontal scales are logarithmic.

The vertical scale for the flow rate and static head is in three sections. The first section from 0.1 to 1.0 is at 0.1 unit intervals, the second section from 1.0 to 10.0 is at 1.0 unit intervals and the third section from 10 to 100 is at 10 unit intervals.

The horizontal scale for time is in two sections — section one from 10 to 100 is at 10 unit intervals and section two from 100 to 1000 is at 100 unit intervals. The one exception is the time scale for sweet corn, where section one is from 100 to 1000 at 100 unit intervals and section two from 1000 to 10 000 is at 1000 unit intervals.

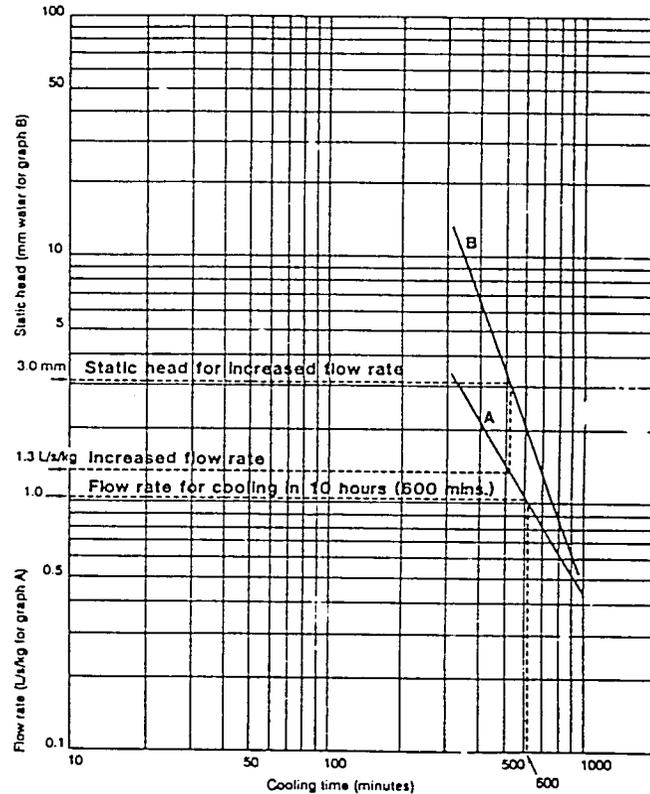


Figure 14

How to use the graphical data.
Product: rockmelon (11 count).
Container: 30 litre tray, 6/layer.

84

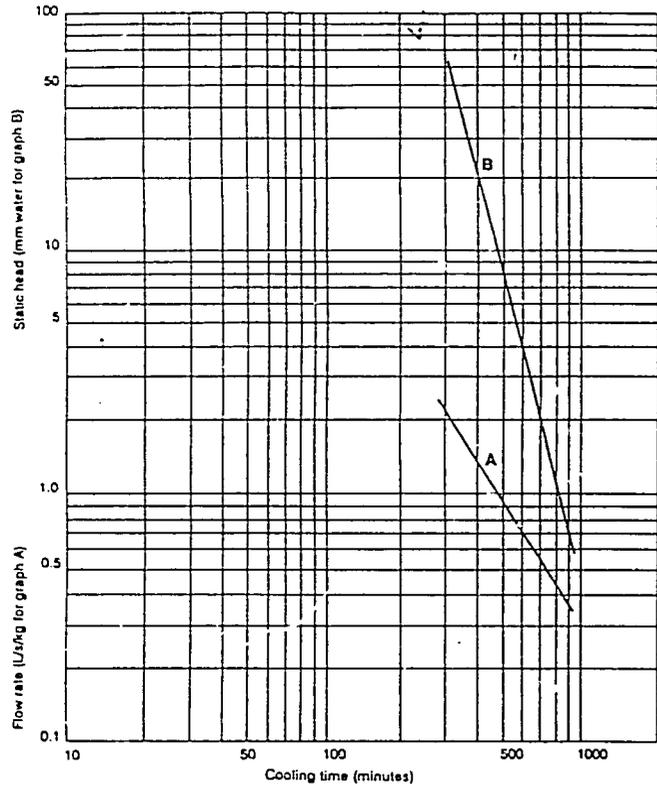


Figure 15 (a) Avocado: graphical data.
 Container: single layer tray carton, three side vents and two end vents, pinwheel stack, 8/layer.

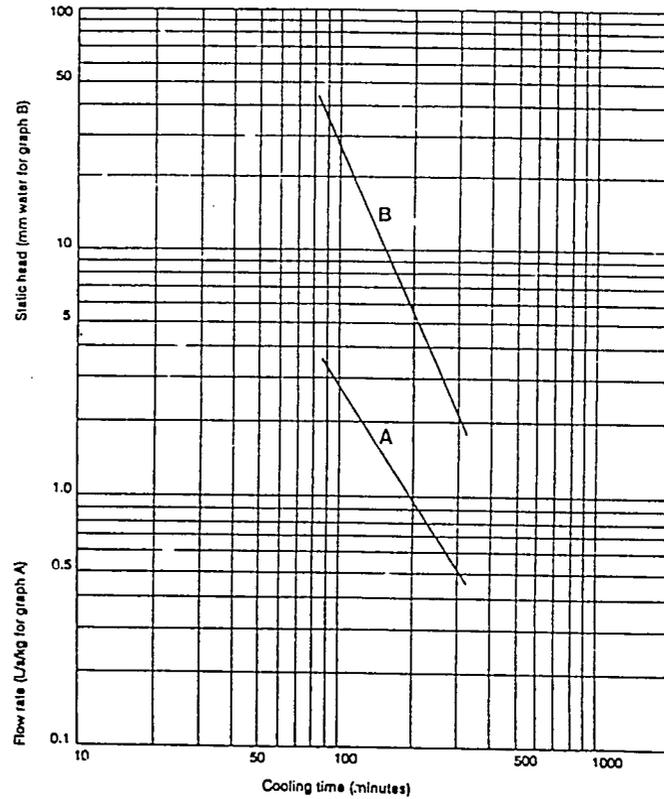


Figure 15 (b) Bean: graphical data.
 Container: 46 litre carton, 6/layer.

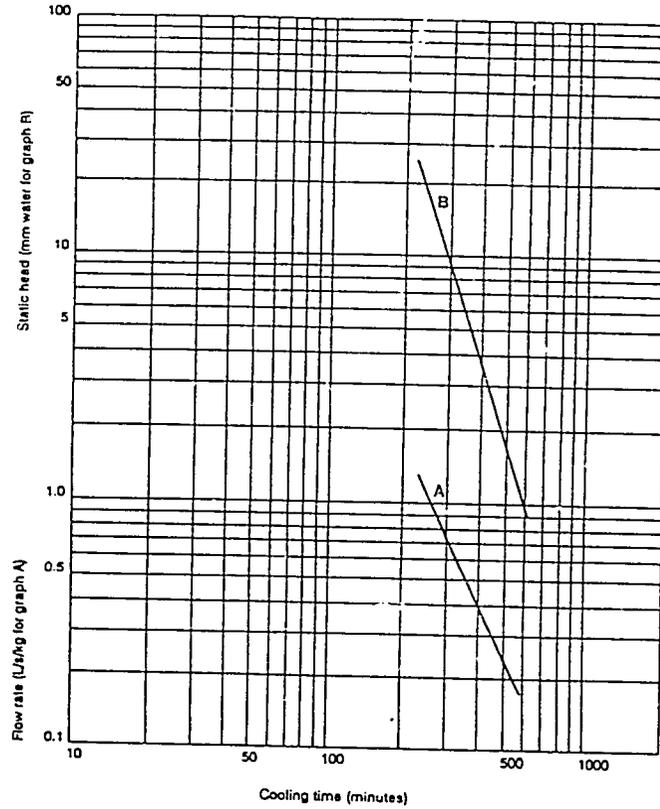
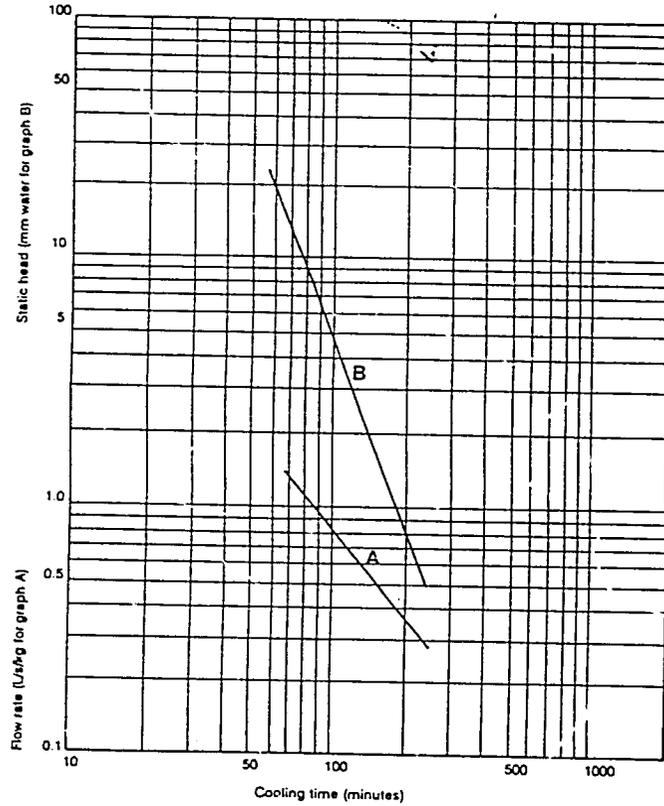


Figure 15 (c) Broccoli: graphical data.
Container: 46 litre carton, 6/layer.

Figure 15 (d) Brussels sprout: graphical data.
Container: 18 litre carton, 12/layer

86

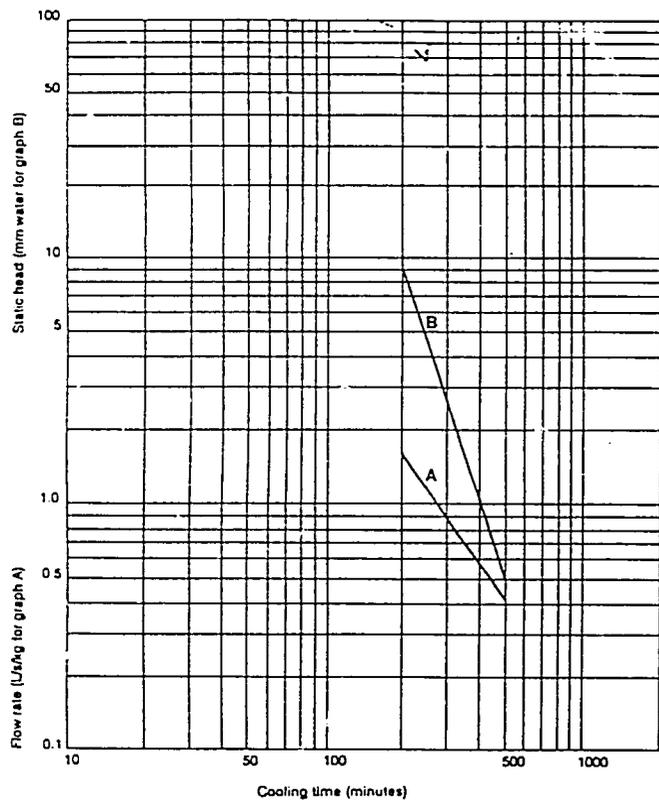


Figure 15 (e) *Capsicum*: graphical data.
Container: 18 litre carton, 12/layer

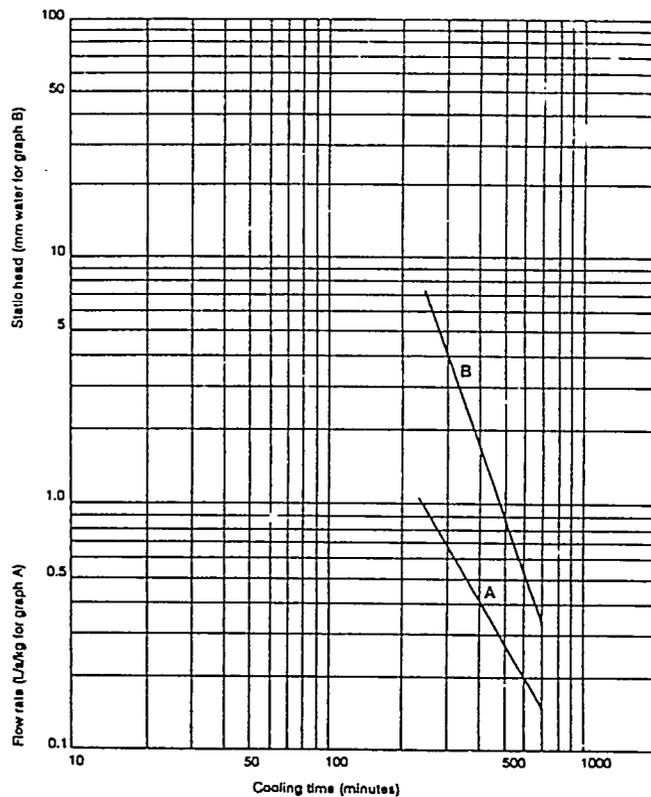


Figure 15 (f) *Celery* (10 count): graphical data.
Container: 46 lit' e carton, 6/layer.

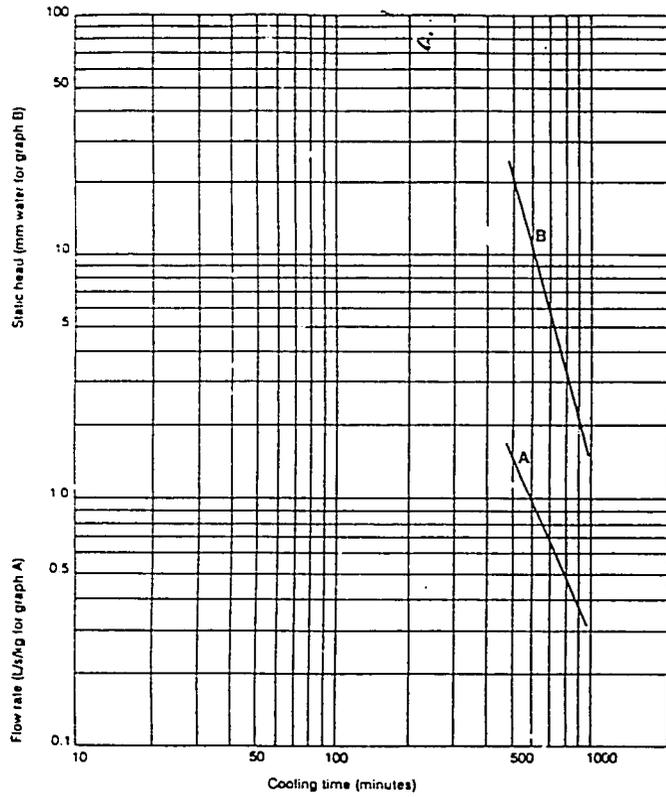


Figure 15 (g) Cucumber: graphical data.
Container: 18 litre carton, 12/layer.

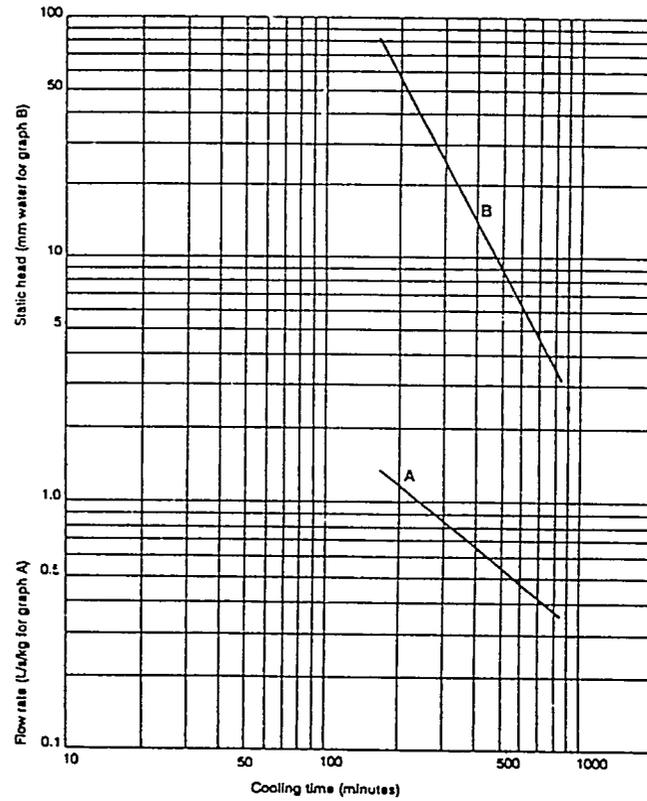


Figure 15 (h) Lettuce: graphical data.
Container: 58 litre carton, 6/layer

88

34 Lychee: graphical data

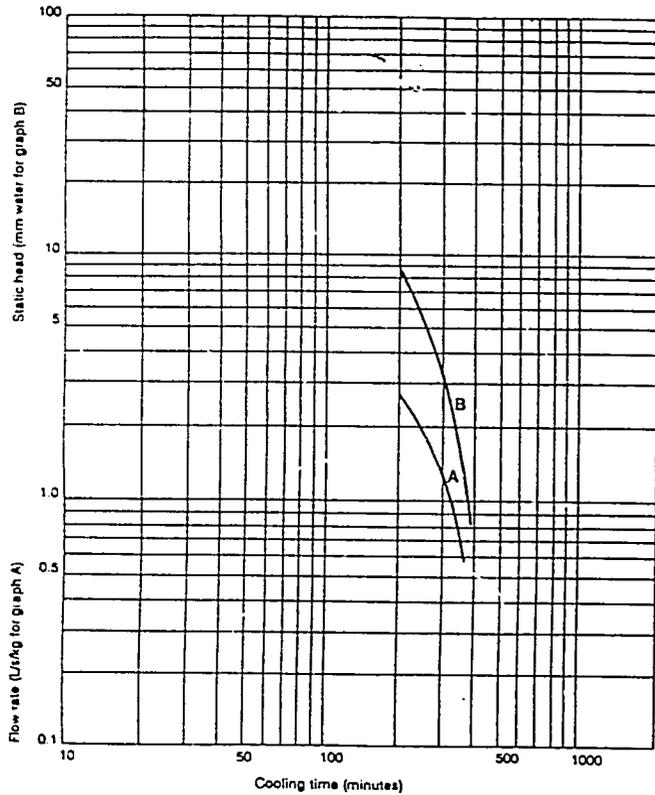


Figure 15 (I) Lychee: graphical data.
 Container: 15 punnet carton, punnets overwrapped with plastic film.

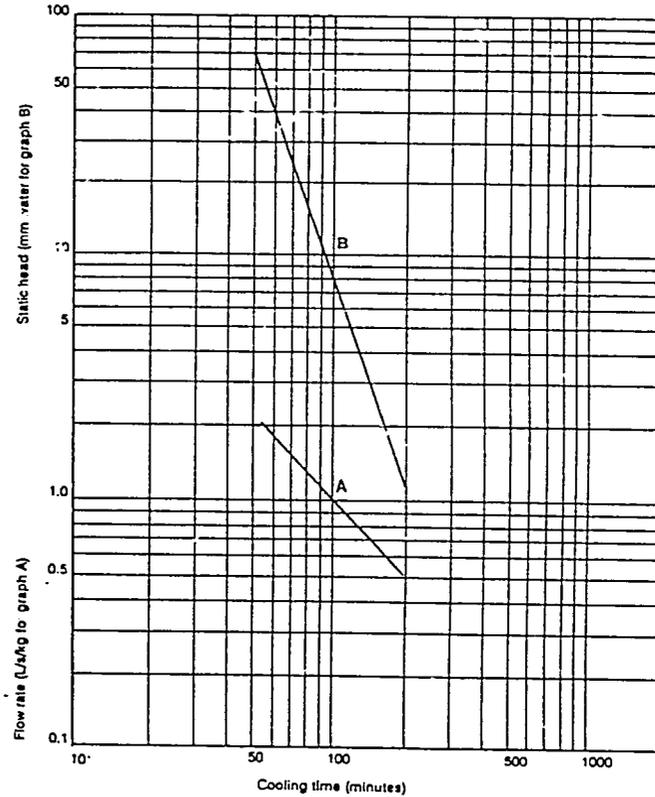


Figure 15 (J) Mushroom: graphical data.
 Container: 9 litre tray, 12/layer.
 N.B. For cooling single-carton-width tiers, multiply the above static head value by 0.05.
 For cooling two-carton-width tiers, multiply the static head rating by 0.3.

89

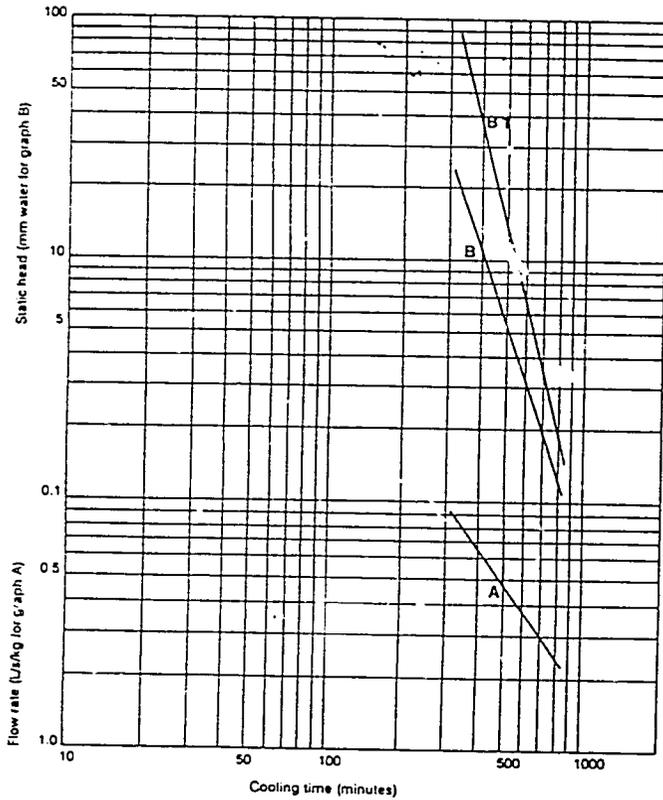


Figure 15 (k) Peach: graphical data.
 Container: 18 litre tray, 12/layer.
 N.B. For peaches in single-layer trays, use the above
 flow rates and static head graph B1.

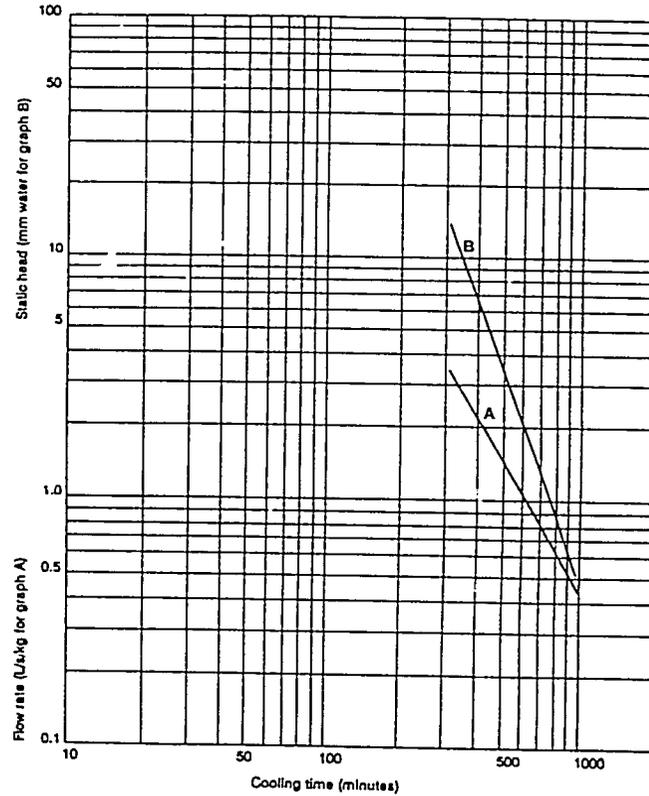


Figure 15 (l) Rockmelon (11 count): graphical data.
 Container: 30 litre tray, 6/layer.

90

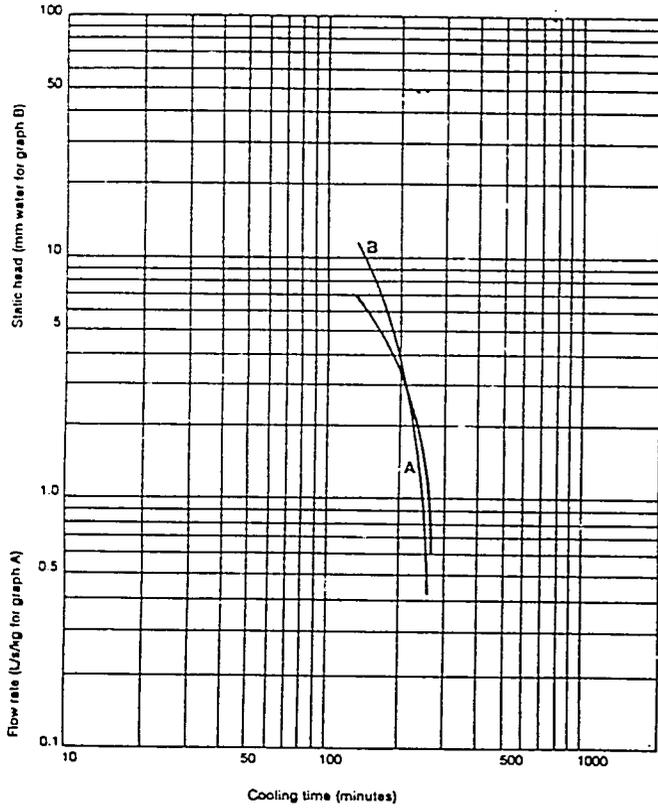


Figure 15 (m) Strawberry: graphical data.
 Container: 20 punnet carton, punnets overwrapped with plastic film.

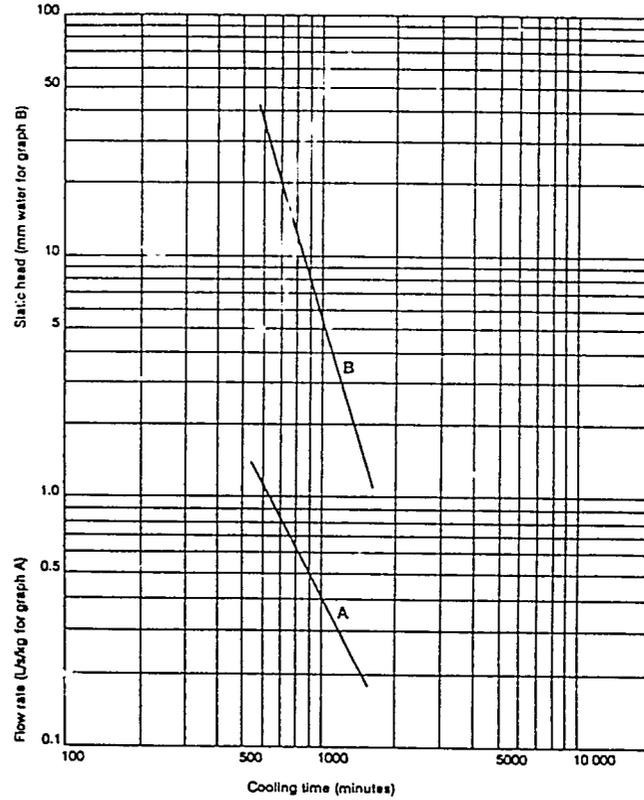


Figure 15 (n) Sweet corn: graphical data.
 Container: 18 litre carton, 12/layer.
 N.B. Time scale commences at 100 minutes.

91

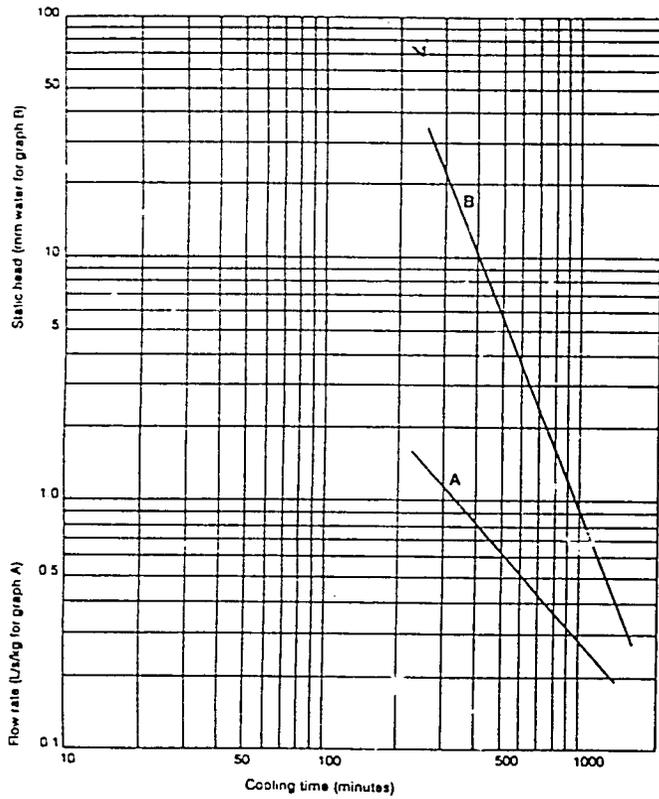


Figure 15 (o) Tomato: graphical data.
 Container: 18 litre carton with two 75 mm x 25 mm end vents,
 12/layer.

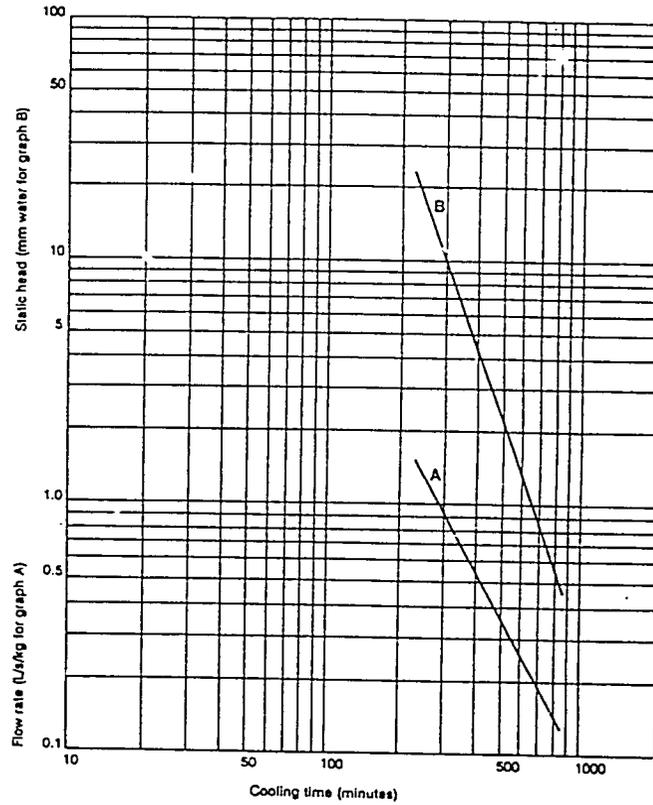


Figure 15 (p) Zucchini: graphical data.
 Container: 18 litre carton, 12/layer.

92

APPENDIX 1

Package weights for fruit and vegetables

The following list shows the type of package unit commonly marketed, the unit weight and the usual number to a pallet for fruit and vegetables. Marketing weights are necessary for product load calculation when determining total refrigeration load of produce to be cooled after packing.

The number of units in a pallet may vary from the figures shown in the list. This should be checked with the client concerned before calculating product load. Unit weight where variable should also be checked.

		Fruit	
Variety	Unit	Kg/unit	No./pallet
Apple	tray pack carton	18	48
Apricot	18 litre carton	10	96
Avocado	tray	6	120
Banana	27 litre carton (B19)	12	72
	30 litre carton (B21)	13	64
Grapefruit	citrus pack	15	60
Grape	1/2 box	10	64-80
Kiwifruit	tray	3-4	160
Lemon	citrus pack	18	60
	1/2 citrus pack	9	104
Mandarin	citrus pack	15-18	60
	1/2 citrus pack	7.5-9	104
Mango	tray	6.5	120
Nectarine	tray	4-5	120
	18 litre carton	10	96
Olive	18 litre carton	10	96
Orange	citrus pack - navel	18	60
	- other var.	20	60
Papaw	30 litre package	13	48-60
Passionfruit	28 litre carton	8-10	96
Peach	18 litre carton	10	96
	tray	4-5	120
Pear	carton	18	56
Plum	18 litre carton	10	96
Pineapple	carton	22	36
	plastic crate	24	36
Rockmelon	32 litre carton	15-20	48
	tray	12-16	60
Strawberry	20 punnet carton	5	-
	punnet	0.25	-
Watermelon	-	5-10 each	-

continued

		Vegetables	
Variety	Unit	Kg/unit	No./pallet
Aniseed	carton	12	-
Artichoke	carton	10	-
Bean	bag	20	-
	carton	10	48-60
Beetroot	bunch	2-3	-
	bag	20	-
Broccoli	32 litre carton	8	48
	ice pack	8-10	36
Brussels sprout	18 litre carton	10	96
Button squash	13 litre carton	10	96
Cabbage	crate	46	-
- ballhead	each	3.5	-
- sugarloaf	32 litre package	20	48
Carrot	bag	20	48
Capsicum	18 litre package	6.5	*64 or **96
	36 litre	13	48
Cauliflower	crate	45	-
	carton	20	24
Celery	carton	23	42
Choko	carton	20	48
Cucumber	28 litre package	10	*64 or **96
Eggfruit	18 litre package	7	*64 or **96
Eshallot	bunch	0.5	-
Garlic	bag	20	-
Lettuce	carton	12-16	36
Marrow	32 litre carton	20	-
Mushroom	carton	3	-
Onion	bag	18	-
Parsnip	carton	20	-
	bag	20	-
Pea	bag	20	-
Potato	sack	65	-
	bag	50-55	-
Pumpkin	sack	55	-
- butternut	bag	18	-
- papaw	bag	18	-
Radish	bunch	0.5	-
Rhubarb	bundle	5	-
	carton	10	-
Sweet corn	18 litre package	10	*64 or **96
Silverbeet	bunch	1-1.5	-
Sweet potato	carton	20	-
Swede turnip	bag	20	-
Tomato	18 litre package	10	*84 or **96
Zucchini	18 litre package	10	*64 or **96

* polystyrene box

** fibreboard carton

APPENDIX 2

Recommended temperature and relative humidity for storage of fruit and vegetables

Commodity	Temperature (°C)	Relative humidity (%)	Maximum life*
Apple	0 to 2	90 to 95	2 to 8 months
Apricot	0	90 to 95	2 to 3 weeks
Artichoke	0	95	2 to 3 weeks, globe; 4 to 5 months, Jerusalem
Asparagus	0 to 2	95	2 to 3 weeks
Avocado - unripe	5 to 7	90 to 95	4 weeks
eating ripe	2	90 to 95	1 week
Banana - green	13	90 to 95	2 to 3 weeks
Bean (green)	5 to 7	95	7 to 10 days
Bean sprouts	0	95	7 to 9 days
Beetroot	0	95 to 100	4 to 6 months (if topped)
Berries - blackberry	0	90 to 95	2 to 3 weeks
blueberry	0	90 to 95	2 weeks
raspberry	0	90 to 95	3 to 4 weeks
loganberry	0	90 to 95	2 to 3 days
raspberry	0	90 to 95	2 to 3 days
Broccoli	0	95	10 to 14 days
Brussels sprout	0	95	3 to 5 weeks
Cabbage (ballhead, Chinese, etc.)	0	95	1 to 4 months
Carambola	5	90 to 95	3 to 4 weeks
Capsicum	7 to 10	90 to 95	3 to 4 weeks
Carrot - mature	0	95	7-9 months (if topped)
immature	0	95	4 to 6 weeks (if topped)
Cauliflower	0	95	2 to 4 weeks
Celery	0	95	2 to 3 months
Cherry	0	90 to 95	2 to 3 weeks
Choko	10	90 to 95	10 to 12 weeks
Coconut	0 to 2	80 to 85	1 to 2 months
Cucumber	10	90 to 95	10 to 14 days
Custard apple	12	90 to 95	1 to 2 weeks

continued

Commodity	Temperature (°C)	Relative humidity (%)	Maximum life*
Date	0	75	6 to 12 months
Eggplant	8 to 12	90 to 95	1 week
Endive	0	95	2 to 3 weeks
Fig	0	85 to 90	7 to 10 days
Garlic (dry)	0	65 to 70	6 to 7 months
Ginger (rhizomes)	13	65	6 months
Grape	0	90 to 95	3 to 6 months
Grapefruit	14 to 16	85 to 90	4 to 6 weeks
Guava	5 to 10	90	2 to 3 weeks
Kiwifruit	0	90 to 95	2 to 3 months
Kohlrabi	0	95	2 to 3 months
Leafy greens (kale, collard, rape, swiss chard)	0	95	10 to 14 days
Leek	0	95	2 to 3 months
Lemon	14 to 15	85 to 90	4 to 6 months; may be held at 7 to 14°C for 1 month
Lettuce	0	95	2 to 3 weeks
Lime	9 to 10	85 to 90	6 to 8 weeks
Loquat	0	85 to 90	3 weeks
Lychee	5 to 8	90 to 95	3 to 5 weeks
Mandarin	5	85 to 90	2 to 3 weeks
Mango	13	85 to 90	2 to 3 weeks
Melons - honeydew	7 to 10	90 to 95	3 to 4 weeks
rockmelon	2 to 5	90 to 95	1 to 2 weeks
watermelon	10 to 15	85 to 90	2 to 3 weeks
Mushroom	0	95	3 to 4 days
Nectarine	0	90 to 95	2 to 3 weeks
Nuts	0	60 to 75	4 to 24 months
Okra	7 to 10	90 to 95	7 to 10 days
Olive	5 to 10	85 to 90	4 to 6 weeks
Onion	0	65 to 70	1 to 8 months
Orange	5	85 to 90	3 to 12 weeks
Papaw	13	90 to 95	1 to 3 weeks
Parsnip	0	95	2 to 6 months (if topped)
Passionfruit	7	90 to 95	2 to 4 weeks
Pea (green)	0	95	1 to 2 weeks
Peach	0	90 to 95	2 to 4 weeks
Pear	-1 to 0	90 to 95	2 to 6 months
Persimmon	0	90 to 95	1 to 4 months
Pineapple	20	85 to 90	1 to 2 weeks
Plum	0	90 to 95	1 to 4 weeks
Potato - culinary seed	13	90 to 95	1 to 2 months
seed	4	90 to 95	5 to 8 months

continued

APPENDIX 3

Examples of coolroom designs

The following coolroom designs are representative of a range of forced-air coolers which have been designed for various fresh commodities. Most include provision for short-term storage of cooled produce.

Although each design is for specific requirements of a particular commodity, most can be adapted for other commodities without any radical change to room layout or dimensions. However, refrigeration capacity and/or auxiliary fan specifications will probably need to be changed to meet the requirements for different cooling times for different commodities. For example, design 1 could be used for cooling two pallets of peaches in 12 hours, but peaches require less air flow than cucumbers for the same cooling time. Conversely, if the auxiliary fan remains unchanged, the peaches would cool in less than 12 hours only if the refrigeration capacity were increased to meet the higher demand for faster cooling.

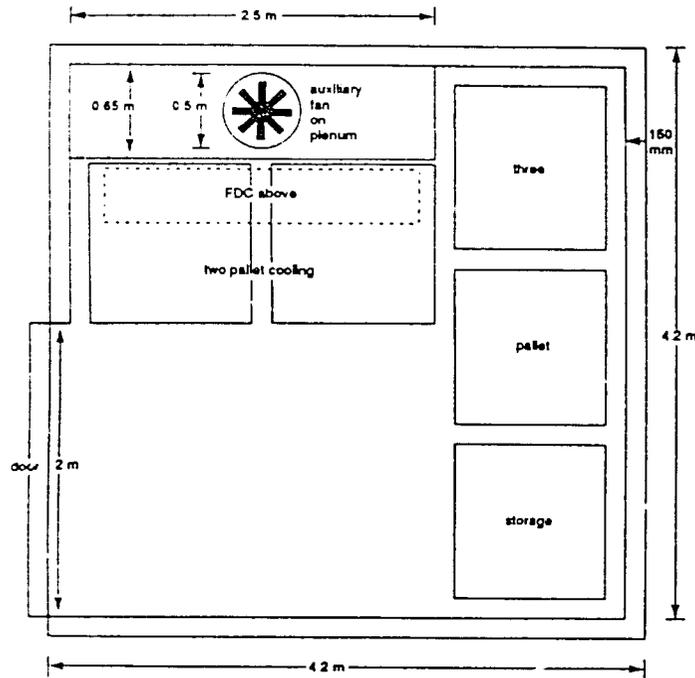
Auxiliary fan selection is discussed on page 20. Although the total air quantity and static head requirements are sufficient specifications for selecting a fan, a fan catalogue is needed to select a particular model from a range of possible options. This is more important when converting an existing room to a forced-air cooler. Available space for housing the fan is sometimes limited and the smallest fan of the options available may have to be selected.

Twin compressors operating in tandem (two per FDC) are suggested where there are large differences between the high peak capacity required when cooling begins and the far lesser capacity required for subsequent storage. Both compressors are run during cooling, and as the end of cooling approaches, one compressor can be turned off, either automatically or manually. This reduces the refrigeration capacity to half and increases the room humidity. Another advantage is that some refrigeration is available if one compressor fails. Note that not all makes of compressors can be used safely in tandem.

46 Appendix 2: recommended temperature and humidity

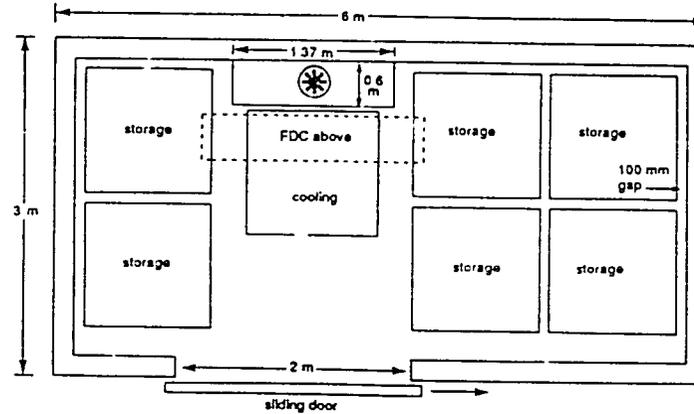
Commodity	Temperature (°C)	Relative humidity (%)	Maximum life*
Pumpkin	13	85 to 90	2 to 4 months
Quince	0	85 to 90	2 to 3 months
Radish	0	95	3 to 4 weeks
Rhubarb	0	95	2 to 4 weeks
Silverbeet, spinach	0	95	1 to 2 weeks
Squash —			
button	7	95	1 to 3 weeks
hard shell	13	85 to 90	1 to 3 months
Strawberry	0	95	5 to 7 days
Sweet corn	0	95	4 to 8 days
Sweet potato	13 to 16	85 to 90	4 to 6 months
Tamarillo	3 to 4	85 to 90	10 weeks
Taro	7 to 10	85 to 90	4 to 5 months
Tomato —			
mature green	13	85 to 90	2 weeks
firm ripe	5 to 7	85 to 90	3 to 5 days
Turnip	0	90 to 95	4 to 5 months
Yam	16	70 to 80	6 to 7 months
Zucchini	7 to 10	90 to 95	1 to 2 weeks

*Storage life of some commodities can be extended by controlling or modifying the oxygen and carbon dioxide concentrations in the atmosphere around the commodity



Design 1

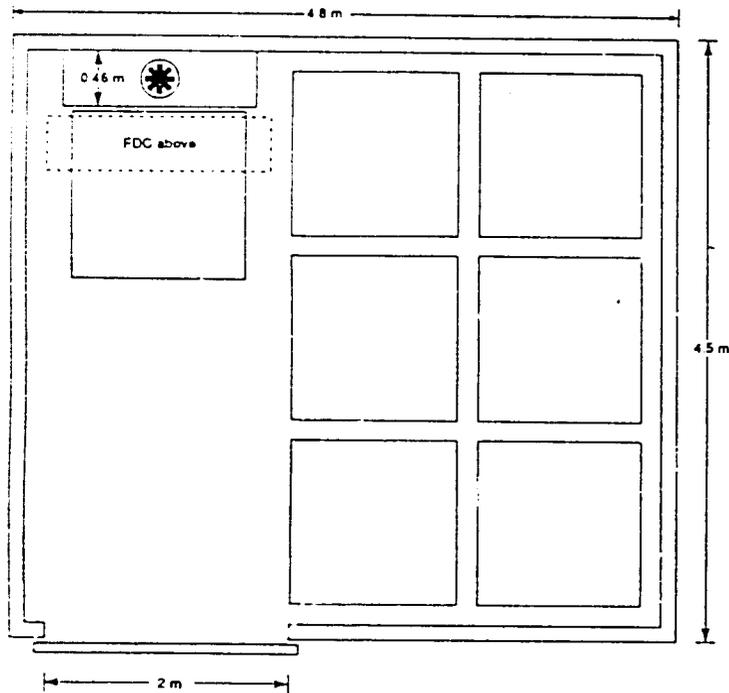
<i>Cooling</i>	2 pallets cucumbers in 12 hours or 1 pallet beans in 4 hours
<i>Storage</i>	3 pallets
<i>Room temperature</i>	7°C
<i>Dimensions</i>	4.2 m x 4.2 m x 2.8 m (height)
<i>Insulation</i>	150 mm
<i>Refrigeration capacity</i>	6000 watts at 2°C suction (20 000 Btu/h)
<i>Plenum</i>	as per Figure 6
<i>Auxiliary fan</i>	1560 L/s (3300 cfm) at 6 mm static head



Design 2

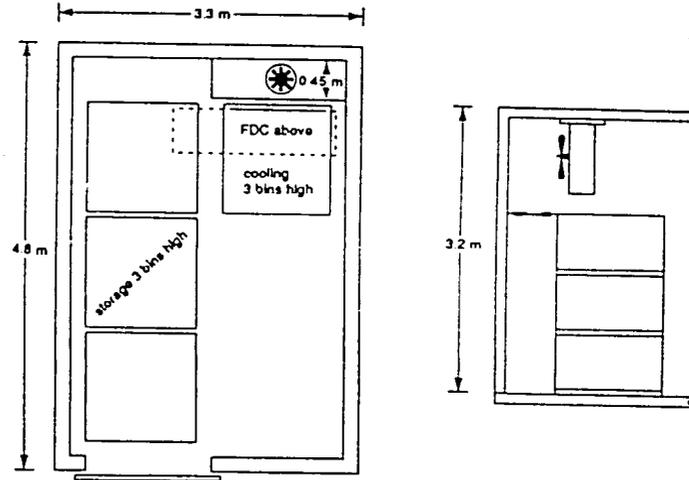
<i>Cooling</i>	1 pallet beans in 2 hours
<i>Storage</i>	6 pallets
<i>Room temperature</i>	7°C
<i>Dimensions</i>	6 m x 3 m x 3 m (height)
<i>Insulation</i>	150 mm
<i>Refrigeration capacity</i>	12 000 watts at 2°C suction (40 000 Btu/h)
<i>Auxiliary fan</i>	1650 L/s (3500 cfm) at 35 mm static head

96



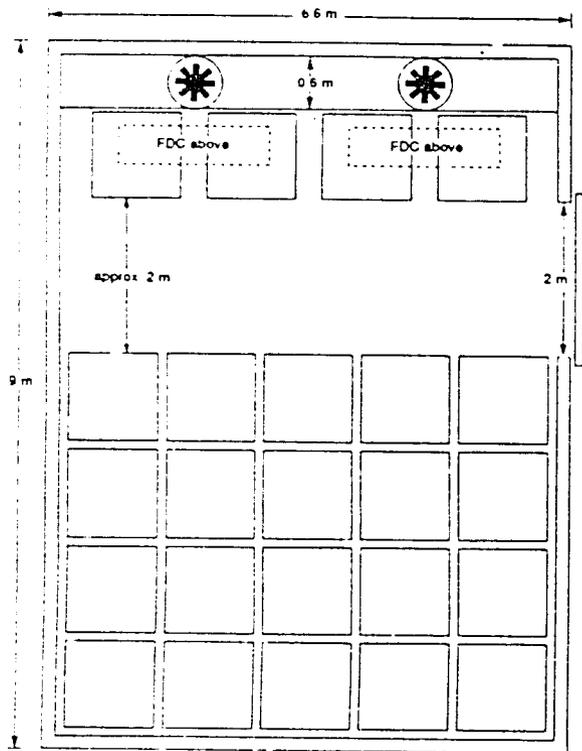
Design 3

Cooling 1 pallet avocados in 12 hours
Storage 6 pallets
Room temperature 7°C
Dimensions 4.8 m x 4.5 m x 3 m (height)
Insulation 75 mm
Refrigeration capacity 3680 watts at 2°C suction (12 550 Btu/h)
Auxiliary fan 710 L/s (1500 cfm) at 4 mm static head



Design 4

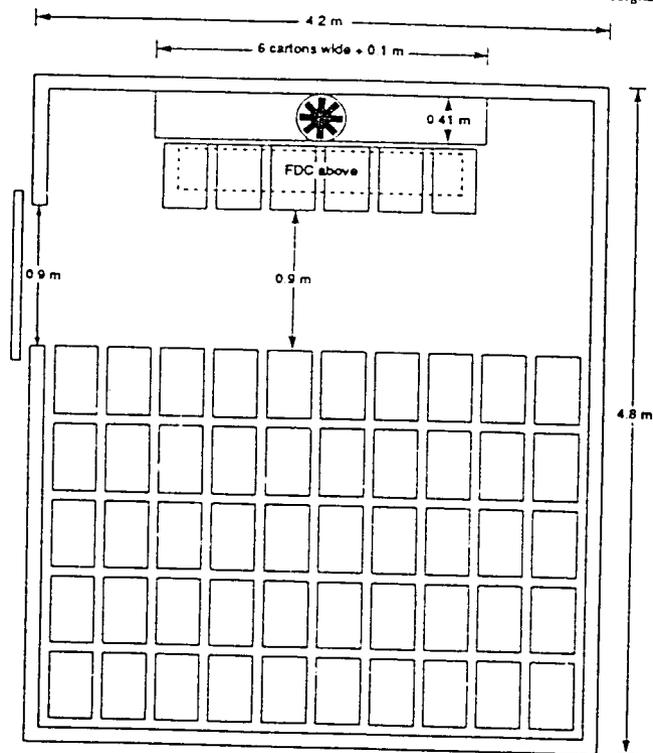
Cooling 3 bins stone fruit in 12 hours
Storage 9 bins
Room temperature 0°C
Dimensions 4.8 m x 3.3 m x 3.2 m (height)
Insulation 150 mm
Refrigeration capacity 5860 watts at -5°C suction (20 000 Btu/h)
Auxiliary fan 570 L/s (1200 cfm) at 6 mm static head



Design 5

- Cooling* 4 pallets grapes in 4 hours
- Storage* 20 pallets
- Room temperature* 0°C
- Dimensions* 9 m x 6.6 m x 3 m (height)
- Insulation* 150 mm
- Refrigeration capacity* 45 427 watts at -5°C suction (155 000 Btu/h)
- Auxiliary fan* 2 fans - 1650 L/s (3500 cfm) at 35 mm static head

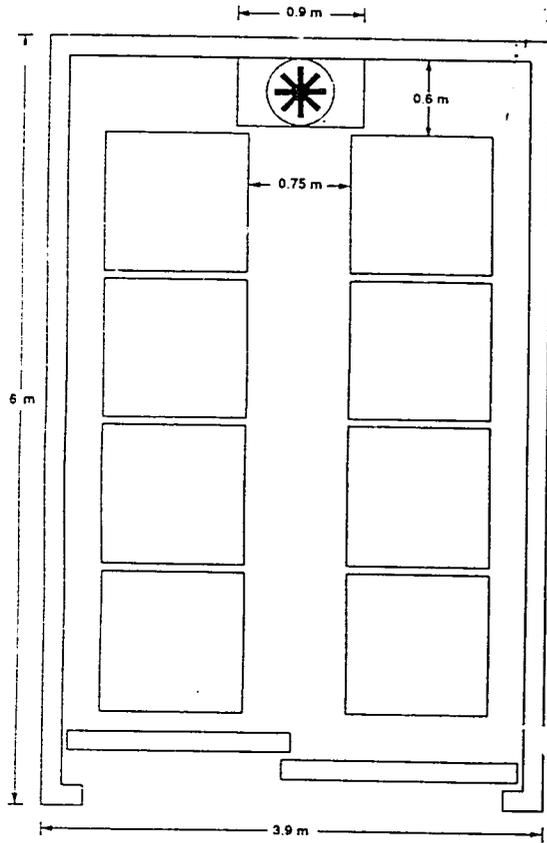
N.B. Pallets to be handled by pallet jack, as passageway between cooling and storage areas would have to be increased to 5 metres for forklift operation.



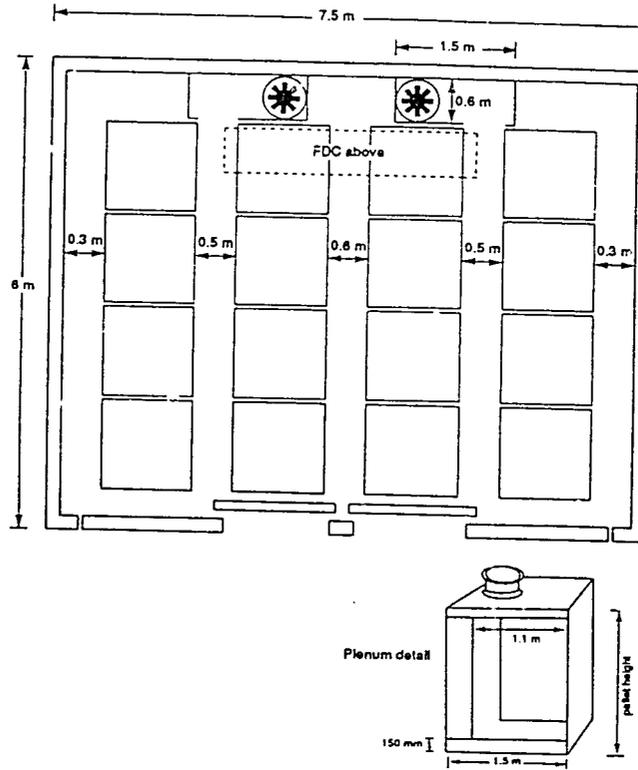
Design 6

- Cooling* 60 cartons grapes in 3 hours
- Storage* 500 cartons in storage area plus extra cartons on either side of plenum
- Room temperature* 0°C
- Dimensions* 4.8 m x 4.2 m x 2.8 m (height)
- Insulation* 150 mm
- Refrigeration capacity* 8350 watts at -5°C suction (28 500 Btu/h)
- Auxiliary fan* 570 L/s (1200 cfm) at <1 mm static head

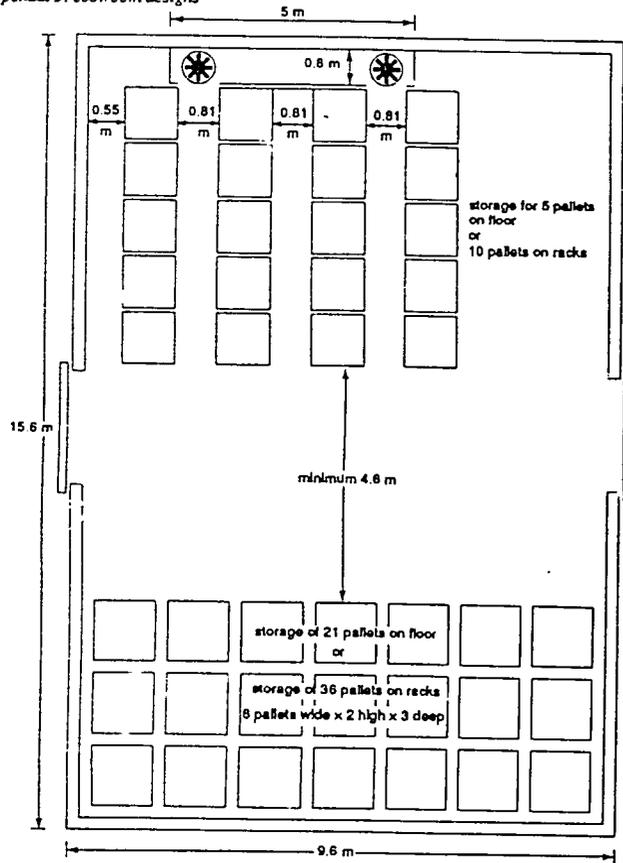
N.B. For peaches, the cooling time would be approximately 6 hours. Refrigeration capacity could be reduced to 5275 watts.



Design 7
 Cooling 8 pallets lettuce in 8 hours
 Room temperature 0°C
 Dimensions 6 m x 3.9 m x 3 m (height)
 Insulation 150 mm
 Refrigeration capacity 20 000 watts at -5°C suction (70 000 Btu/h)
 Auxiliary fan 3780 L/s (8000 cfm) at 25 mm static head



Design 8
 Cooling 16 pallets peaches in 12 hours (fruit in 8/layer trays)
 Room temperature 0°C
 Dimensions 7.5 m x 6 m x 3 m (height)
 Insulation 150 mm
 Refrigeration capacity 31 000 watts at -5°C suction (106 000 Btu/h)
 Auxiliary fan 2 fans - 1890 L/s (4000 cfm) per fan at 7 mm static head
 N.B. Auxiliary fans are offset on top of plenums to allow better air return behind the FDC above.



Design 9

Cooling	20 pallets mixed produce in 12 hours
Storage	26 pallets on floor or 46 pallets on racks
Room temperature	7°C
Dimensions	15.6 m x 9.6 m x 4.5 m (height)
Insulation	75 mm
Refrigeration capacity	64 478 watts at -2°C suction (220 000 Btu/h)
Auxiliary fan	2 fans - 3780 ¹ Js (8000 cfm) per fan at 20 mm static head

100

STRAWBERRY INDUSTRY REVIEW - NEW ZEALAND

1st draft 30 March 1993

Background

The strawberry industry is well established and has a strong preference to continue without marketing or formal organisational structures. A free enterprise approach has successfully operated in the past with this industry and it is intended that this situation continues. However at the Berryfruit Federation conference of 1992, it was voted that a focus group be established to co-ordinate strawberry matters and especially research and development. The Berryfruit Growers Federation and the NZ Berryfruit Propagators Ltd are presently the focus groups for the strawberry industry.

Industry statistics

i Area and grower numbers over time

Year	Grower Nos.	Area Ha
1984		275
1985		311
1986		312
1987	299	210
1988		226
1989		199*
1990		194*
1991	199	193*
1992	218	197*

Although the area has not increased, plant numbers per hectare have increased since 1988.

2 District Distribution 1992

District	Area Ha
Auckland	85
Waikato	14
BOP	6
Hawkes Bay	12
Taranaki/Wanganui	5
Sthn Manawatu	31
Wairarapa	2
Nelson	5
Canterbury	15
Sth Canterbury	13
Otago	5
Southland	3

3 Size distribution (1992/93 data)

Size (ha)	No of growers
0-0.49	113
0.5-0.99	41
1-1.99	32
2-4.99	25
5-9.99	2
10+	3
Total	216

4 Plant production

There are 6 commercial plant growers growing plants in 1992. A Strawberry Runner Scheme established by the Berryfruit Growers Federation in 1985. The present Registrar of the scheme is G Langford of HortResearch. Distribution of these plants by variety in 1991 and 1992 was as follows:

STRAWBERRY RUNNER PLANT NUMBERS		
Variety	1991	1992
Aiko	189050	182190
Aptos	318775	538000
Brighton	35200	
Chandler	251900	219400
Cruz	8250	
Donna	53900	21500
Douglas	34725	34000
Fern	28400	19100
Mrak		1000
Orion	190600	98500
Pajaro	9968809	12502797
Parker	75125	121500
*Redgauntlet	340000	120000
Santana	3700	
Soquel	16375	
T44		33500
*Tioga	625600	520000
Tristar		500
Tustin		40500
Totals	12140409	14450987

* Estimated from parent plant numbers

5 Exports

5.1 Fresh export trends

Year	Volume t	Value FOB \$m	Value/kg
1987	752	5.62	\$7.47
1988	777	4.76	\$6.13
1989	867	5.58	\$6.43
1990	857	5.34	\$6.23
1991	1045	7.03	\$6.72
1992	1165	7.24	\$6.21

5.2 Country distribution

Totals	1991		1992	
	1045t	\$7030627	1165t	\$7239619
Country	%	\$/kg	%	\$/kg
Australia	19	5.70	4.6	5.76
Bahrain			1.0	5.42
Canada	2	5.93	3.9	7.06
United Kingdom	3	7.68	2.0	10.23
Hong Kong	27	6.38	26.3	6.49
Japan	10	11.75	4.3	10.75
New Caledonia	2	6.36	2.0	6.14
French Polynesia	1	7.13	1.1	6.67
Saudi Arabia			1.3	6.77
Singapore	12	6.78	10.0	5.11
USA	19	5.64	41.1	5.61
Total No. Countries	22	6.72	32	6.21

6 World production

Obtaining reliable statistics of production from many countries is very difficult. One attempt at this was carried out at the USA National Strawberry Conference in 1980. At that time production estimates were as follows:

Country	Production in 000 tonnes
USA	224
Japan	115
Mexico	110
Poland	100
Italy	74
France	57
Yugoslavia	56
United Kingdom	50
Germany	49
Netherlands	32
Bulgaria	30
Belgium	25
Hungary	21
Canada	19
Czechoslovakia	15
Denmark	11
Norway	10
Spain	8
Greece	5
Lebanon	5
New Zealand	4
Australia	3
Finland	3
Israel	2

It is likely that a number of changes have occurred since this time and South American countries in particular are likely to be significant producers.

SWOT analysis

Strengths

- Well known
- Widely liked
- NZ Xmas tradition
- Easy to enter in small way
- Positive attitude to R&D
- Well supplied variety stream
- Well organised plant production
- Sophisticated production and marketing systems

Weaknesses

- Easy entry therefore tendency to oversupply at peak periods
- Lack of a specific strawberry industry organisation
- Lack of knowledge on changing consumption patterns
- High labour input required
- No control over information flows
- Poor quality (eating and appearance) of much of the fruit sold on local market
- Low profitability margins

Opportunities

- Export niches
- Expansion of NZ consumption
- Year round production
- Better tasting varieties

Threats

- Pacific rim countries producing in NZ season with cheaper labour
- Lack of sufficient new developments to maintain competitive advantage
- Higher yielding varieties planted without consequent market expansion
- Loss of Methyl Bromide
- Competition from other berryfruits

Industry Plan

Key strategies

1 Development of a wider industry base

At present the industry is very vulnerable to further erosion of its traditional export markets of USA and Japan. The significance of Auckland as the major production region especially for export does leave the industry vulnerable to climatic disasters (such as a tornado) or to the lack of suitable soil sterilant materials when there is no other major production region. A second major region, when targeted at the strength of that region, would spread the risks. However any additional production must be aimed at new export niches or increased domestic consumption.

Possibilities include:

Mid summer and autumn production in Canterbury

Organic production

Holiday resort seasonal production

2 Improvement of profitability

Increased profitability in strawberries could be achieved through:

2.1 Increasing prices

2.2 Reducing production costs

2.3 Increasing productivity which does not adversely affect prices or production costs

3 Maintaining production capability

The planned phasing out of methyl bromide poses a threat if satisfactory alternatives can't be found.

Research and Development priorities

The research and development programme is targeted at the industry goals. More specifically, the areas that are rated as important that will lead to these being satisfied are (not necessarily in order of importance):

1 New variety development

There are two specific targets for this programme.

- a Development of varieties with better flavours, harvesting and grading characteristics for traditional markets
- b Development of varieties suitable for development of export opportunities in non traditional areas especially mid summer to late autumn and through pest and disease resistant varieties suitable for organic production.

2 Better use of existing knowledge

Many basics of plant management and fruit production methods are known but their application is not always widespread. Technology transfer systems that ensure wider application will lead to a more efficient industry.

3 Lower labour costs for harvesting and grading

This includes systems for improved labour performance, harvesting and grading aids

4 Lower packaging material costs

Includes alternative packaging and ideas which recognise international trends in waste disposal.

5 Improved appearance and flavour at point of sale

Any products or handling and distribution systems that contribute to this goal is expected to lead to increased demand and improved prices. This will need to include technology transfer programmes which will ensure adoption by growers and the distribution chain.

6 Development of organic production systems

It is expected that this will be a largely commercial development. However aspects of organic production could be of long term benefit to the whole industry.

7 Methyl Bromide alternatives

Both alternative materials and alternative ways of achieving the same objective without the use of chemicals are encouraged.

8 Improved plant quality

Plant quality is the basis for the efficient production of quality fruit. Improvements which lead to greater productivity, lower plant losses and lower pest and disease control costs are encouraged.

Systems for satisfying industry goals

Two main methods are used for encouraging research and development programmes which will satisfy the goals of the industry:

- 1 Researchers may approach strawberry industry bodies for funds. Joint funding programmes especially are encouraged
- 2 Specific researchers may be asked to carry out particular aspects of programmes.

Research and Development Programmes in Progress

1 Breeding Programme

This is a joint programme between Turners and Growers (Michael Hill of Plant Genetics is presently contracted by Turners and Growers to carry out this programme) and HortResearch (Greg Pringle is the current breeder employed by HortResearch for strawberry breeding). NZBP currently contribute to this programme.

2 New Market Development Programme

This a jointly funded programme between AGMARDT and NZBP carried out by Geoff Langford of HortResearch at Lincoln. The programme is identifying varieties and production systems capable of production of high quality fruit suitable for export to Australia and Eastern countries from January to March in Canterbury.

3 Modified atmosphere and heat treatment

This is a jointly funded project between AGMARDT and the Auckland Berryfruit Growers Association.

LIST OF SUBLICENSSED STRAWBERRY PROPAGATORS 1993

Turners & Growers Ltd
P.O. Box 56
Auckland

Ph 09/3774720 Doug Robertson

VARIETIES: Aiko, Aptos, Brighton, Chandler, Douglas, Donna,
Fern, Pajaro, Parker, Redgauntlet, Santana, Soquel,
Tioga, Oso Grande, Orion.

John Macmillan
Beach Road
Katikati

Ph 07/5490631

VARIETIES: Chandler, Pajaro, Tioga, Redgauntlet, Parker,
Oso Grande, Selva.

Peter Robson
Kapiti Kroppers Nursery
49 Lupin Road
Otaki

Ph 06/3647156

VARIETIES: Aiko, Aptos, Pajaro, Chandler, Parker, Tustin
Oso Grande, Selva, Tioga, Red Gauntlet, Irvine
Mrak, Donna, Tristar.

Roy Beecroft
Glencroft Gardens
Wrights Road
Sheffield

Ph 03/3183865 evenings

VARIETIES: Aiko, Sonja, Red Gauntlet, Selva.

Bruce Shanley
Martray Road
R D 1
Katikati

Ph 07/5490070

VARIETIES: Pajaro, Tioga.

Francie Perry
P.O. Box 13051
Onehunga

Ph 09/6222350

VARIETIES: Pajaro, Oso Grande, Fern, Selva, Irvine.

David Pugh
Cloverlea Road
R D 5, Palmerston North

Ph 06/3548244

VARIETIES: Pajaro, Fern, Aiko, Tioga, Red Gauntlet, Aptos,
Irvine, Donna.

///