CHANGING PATTERNS OF FLOUR-MILLING
IN THE SOUTH ISLAND: 1840-1973

A thesis
submitted in partial fulfilment
of the requirements for the Degree
of
Master of Arts in Geography
in the
University of Canterbury

by
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University of Canterbury
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Fig. 1  Wise's New Zealand Post Office Directory, 1885-6.

2 Statistics of New Zealand, 1882.


5 I and C.Files, 26/143/3.

6 I and C.Files, 10th August 1936 and information supplied by the N.Z. Wheat Board.
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The sources of plates are listed below:

Plates 1 and 2 : Hocken Library, Dunedin.
Plate 3 : Weekly Press, October 13th, 1897.
Plate 4 : Canterbury Museum Library.
Plates 5, 6, 7, 8, 9, 10, 11, 12, 16 : Weekly Press Jubilee Number, December 15th, 1900.
Plates 13 and 14 : Weekly Press, December 22nd, 1897.
Plates 15, 17, 18, 19 : Zealandia Milling Co. Ltd.
Plates 20, 21, 22 : The author.
ABBREVIATIONS

A.J.H.R. - Appendices to the Journals of the House of Representatives.

Committee of Enquiry - New Zealand Committee of Enquiry into the Wheat, Flour and Bread Industries, Report to the Minister of Industries and Commerce.

I & C Files - Department of Industries and Commerce Files.

Letterbook - Letterbook of the Wakanui mill later to become Robertson and Co's mill and Buchanan's mill.

L.T. - Lyttelton Times

Press - The Press (Christchurch).

Wheat Board - New Zealand Wheat Board.
ABSTRACT

Soon after the first permanent colonists came to the South Island the first flour-mills were established to produce flour for the needs of the population. Since that day technological progress has brought changes in the location of mills. The development of milling is outlined in this thesis together with the impact that new inventions have had on the pattern of mill locations in various time periods. Factors other than inventions are also discussed. These include the regulation of the industry by millers themselves, and, more recently the impact that government control has had on the pattern of mills. Through an historical study it is possible to see how the contemporary pattern evolved. A base is created by this work from which future researchers can gain an insight into the factors that have affected mill locations in the past and which must be borne in mind when predicting future trends. Recommendations are made as to possible lines upon which study could be undertaken.
CHAPTER I

INTRODUCTION

Flour-milling is the process by which wheat is transformed into flour suitable for baking. In this respect, flour-mills are factories taking in wheat as the raw material and through a mechanical process involving power and labour producing a food for human consumption – flour. Western diets are dependent on bread as one of the staple foodstuffs and thus wherever a European population is concentrated, there is a demand for flour.

When wheat is milled, by-products are produced from the husks of the wheat grains. Depending on the degree of fineness, these are known as bran (coarse) or pollard (fine). These are sold as subsidiary products. They have always been used as stock feed and although not as valuable as flour, have contributed to the income of mills. While flour is consumed by the human population, the market for bran and pollard is oriented towards farm livestock and poultry producers.

Flour-milling in the South Island began soon after settlement by European migrants. The demand for flour to make bread was responded to by millers who started mills wherever there was population and a supply of wheat. Once the first mills were established, the number grew as the population increased. The three planned settlements in Nelson, Otago and Canterbury inevitably had millers with
capital who saw the demand for flour created by the new population.

Until the first mills were established flour had to be imported, usually from Australia or Chile. The first flour produced from local grain gave a boost to nearby farmers, at the same time lowering the price of flour. From this time mill numbers were to expand at a great rate in response to the demands of the population, which rapidly increased. It was not until 1890 that mills reached a saturation point, having a capacity that was far in excess of the needs of the South Island and New Zealand as a whole. Since then, as mills have increased in size and distribution has become easier, mill numbers have declined to their present day level.

AIMS

It can be assumed that flour-milling is a processing industry and, as such, mills should locate close to the raw material (the wheat), or close to the markets for flour and by-products. The aim of the study is to assess the influence of a number of factors, believed to be important in the pattern of mill locations in the South Island. The factors include wheat supply areas, population distribution, power sources, mill technology and transport available. All these factors have changed through time and so it is necessary to look at various time periods to see the importance of each as explanations of locational decisions.

Flour-milling is unique as an industry because in the years since 1936 a government body has controlled profits
and many costs, while private enterprise has been responsible for take-overs which have affected mill locations. Investigation will be made into the effect that government regulations have had in altering the pattern of mills comparative to what would have occurred under free competition. Explanations will be sought for the present pattern of mill locations to see how much it reflects factors that were important in the past. By attempting to understand the decision-making processes involved when mills were built in past time periods, it is hoped to rationalize a pattern that in today's technology and society appears chaotic. Reasons for the choice of a site will be examined in each time period to achieve this aim.

Once the important factors that have affected mill locations in the past have been identified, the knowledge will provide a base for future studies of the optimum location for flour-mills. A study of flour-milling has value for its own sake since it affects peoples lives every day through the price of bread. If mills are poorly positioned there will be increased transport costs that will raise the price of flour.

METHODOLOGY

Historical geography provides a tool to logically view mills as they were located in the past. While history tells of the personalities behind the mills, geography adds the dimension of space. Through the reconstruction of past geographies of an area, the decision-making process of the mill owner can be understood. There will, however, always
be an element of chance where mills were built, for example, as a result of insufficient knowledge of other opportunities, or where the mill owner was not motivated by purely economic factors. As a result, the economic details that exist may only explain a portion of the total situation. Without detailed business histories of the many mills that have closed, much of the deduction as to causes of closure must be conjecture.

The method of this study has been to collect relevant facts on past and present mills, their sites, size, market areas, wheat supply areas, and power sources in order to evolve a pattern of changing location through time. The present day pattern is discussed, from where predictions can be made as to what may happen in the future.

STUDY AREA

The South Island is, and has always been, the main wheat-growing area of New Zealand. Within the island, a variety of climate and soil types exist. The physical boundary of water surrounding the island makes it a distinct entity and has definitely affected the mill locations. If water had not separated the wheat-growing area from the markets of the North Island a different pattern would have been created. A contrast between areas of the South Island can easily be seen. For example, the Canterbury-North Otago area has always produced most of the country's wheat crop; Westland has always had negligible wheat grown. Since 1890 wheat growing has declined in Nelson-Marlborough but increased in Southland. These four areas provide sufficient
contrast to illustrate the theories that will be later expounded as important factors in mill locations.

As a single physical entity comprised of several contrasting areas, the South Island provides a suitably sized study area. Reference will constantly be made to the North Island which, because of small wheat production, has provided a market for South Island flour. This factor has played an important part in mill locations.

SOURCE MATERIALS

Historians have frequently recorded the importance of flour-mills as early industries that contributed to regional growth. Local and regional histories have proved valuable in obtaining details of early mills. From pre-1900 trade directories, as published by Wise's, Stone's and McKay's, as well as the Southern Provinces Almanac, the early pattern of mill locations has been examined. Although these sources are not completely reliable, they provide the only information on an island-wide scale. Newspapers have provided information on mills advertising flour as well as contemporary comment on new mills being established.

Primary source material was obtained when mill records or correspondence between various mills and the Department of Industries and Commerce survived. Such information dates from 1900. These sources, together with newspaper reports and New Zealand Wheat Board records, have brought greater confidence in understanding the pattern of mill locations in this period than occurred in the pre-1900 period. A questionnaire was personally administered or
posted to all mills operating in the South Island to reveal production, marketing and other factors of contemporary milling. The questionnaire is included as Appendix I. Additional historical information was gained from this questionnaire.

Published statistics proved to be of little use in understanding the pattern of milling except for data pertaining to areas and quantities of wheat grown by counties. Records of production, which quote the number of mills, motive power, value of production and other facts on a province by province basis, do so for grain mills. Such a term also includes mills that produce oatmeal. Figures for grain mills can be used to show broader trends. Interest in the industries of New Zealand, together with the growing maturity of the dominion, resulted in the publishing, about 1900, of the 'Cyclopaedia of New Zealand'. The series has several volumes which survey the country, province by province, listing the principal industries of each town, together with descriptions and photographs. These volumes provide the first record of comparative sizes of mills and sales areas, although the larger mills get most attention.

An unpublished thesis entitled "A History of Flour-milling in Otago", written by E.N. Harraway has been the most comprehensive study of milling done in New Zealand to date. While written from a historical viewpoint, mill locations are surveyed to show areas of initial expansion and later, decline. Changing locations are referred to, but not mapped. The thesis has been used as a base for the province of Otago, upon which further geographical interpretation has been placed.
RELEVANCE OF INDUSTRIAL LOCATION THEORY

As outlined in the aims, we can consider mill location as dependent on the changing status of various factors. Weber in 1929¹ first suggested that the location of industries could be looked at in terms of: orientation towards raw materials, the transport costs of bringing raw materials to the factories and dispersing products to the markets, labour costs and factors of agglomeration and deglomeration. All these factors can be looked at as explanation of the location of the milling industry even in pre-Twentieth century New Zealand in order to ascertain the criteria on which mills were located. As Oliver said -

"A clear insight into the development of an industry may be obtained by a systematic study of the factors which manufacturers have in mind when locating their works."²

Industrial location theory forms a base for this study as the factors outlined above are examined at various time periods.

TIME PERIODS

A cross-sectional approach has been used as a structure for this study. This involves looking at the location of mills at regular intervals and attempting to explain the reasons for changes in location that occurred over the intervening years. Reasons were sought primarily in terms of the factors of industrial location to see how

¹ C.J. Friedrich, Alfred Weber's theory of the location of industries, 1929.
well they explained the pattern. The data was treated in a chronological order so that all the factors which interacted at one time could be seen.

The dates chosen for the reconstructions of the mill location pattern were not chosen arbitrarily, but were chosen as significant dates, prior to changes that can be specifically dated. The reconstructions fall within the chapters that correspond with important time periods in the development of milling, in the South Island. These time periods were:

1842-1865, when the initial foundations of the milling pattern were laid.
1870-1885, when new innovations were introduced that were to alter the pattern of mill locations.
1885-1900, when the effects of the innovations were first felt.
1900-1936, when efforts were made to control over-production.
1936-1972, when the government maintained overall control of the industry.
1973, when the existing pattern had evolved, and is described.

CONTENT

There are five major factors that explain changes in mill location. These five factors form a theme throughout the thesis:

- changing areas of wheat production.
- changing mill technology, especially relating to site choice and mill capacities.
- changing markets resulting from population distribution changes.
- changing transport technology, enabling easier or cheaper transport of grain or flour.
- a changing Government attitude to its role in controlling the price of bread through control of mills.

These five factors will be considered as the major explanations of the changes that occurred in each of the time periods to be discussed.

PRELIMINARY OVERVIEW

New Zealand has only been settled by Europeans for about one hundred and thirty years. Flour-mills are western inventions and, as such, the introduction to New Zealand of machinery has been dependent on developments overseas. Occasionally parallels will be drawn with trends overseas, especially England and America. The pattern in these two countries has been the same as that in New Zealand - small rural mills have been replaced by larger city mills. Milling in the period changes from a craftsman's occupation to an industrial enterprise requiring much capital and great efficiency to gain profits. In the next chapter the first mills are described together with an assessment of their importance for the colonists.
CHAPTER II

ESTABLISHING THE PATTERN 1840's - 1860's

INTRODUCTION

Similar patterns occurred in the different areas of the South Island as mills were established. Three of the major provinces in the study area will be discussed to show points of similarity and contrast, particularly as applied to choice of site, motive power and wheat supply areas of mills. Decisions that intending mill owners made can only be assumed, except in the case of Nelson province where records of a mill owner are available. Otago, Canterbury and Nelson were the first areas of permanent European settlement in the South Island. Here in the 1840's and 1850's the first mills were established.

DEMAND FOR FLOUR

Bread had been the traditional staple diet of Europeans and the settlers from Britain and other parts of Europe brought with them the tastes acquired in their homeland. Flour was imported by the first settlers to meet their needs but this proved very expensive. Costs of up to £40 per ton\(^1\) were quoted in the first years of settlement.

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Supplies from Australia tended to be irregular and often unpalatable after the sea voyage, so the settlers were keen to see flour-mills founded. In many areas it was the first local industry to be established, as it provided one of the most basic needs of the community.

Flour production requires wheat as the basic raw material. Mills could therefore not be established until wheat was grown locally, although occasionally a mill was established with the knowledge that farmers would respond by growing wheat. Wheat was one of the first crops attempted because -

"Many of the New Zealand Company settlers, even if inexperienced, had ideas current in the southern counties of England, to plough the soil and produce large quantities of wheat." ²

Hall further noted that one of the aims of wheat growing was self-sufficiency for the family in wheat. Once wheat had been grown, flour could be crudely produced by grinding the wheat in small steel hand mills. These were slow and the product had to be sieved to produce flour. Hall comments on this process -

"It needed two hours of daily hand grinding to keep pace with a normal family's consumption of flour. Grinding was a favourite job to give a swagger in exchange for a night's lodging." ³

In areas remote from towns this practice lasted several decades, but in the towns, mills were soon established.

³ Ibid, p.964.
THE TIMING OF THE FIRST MILLS

The first province in the South Island to be settled on a large scale was Nelson. Immigrants arrived on the first ship in 1842 but land was not allotted until the following year. The first flour-mill was subsequently built in 1844. This gap of two years is similar to Otago's. Here the first immigrant ship arrived in 1848 and although a mill was built in the following year it did not commence operations until 1850. This mill was used both as a saw mill and a flour-mill, providing two essential materials for the early settlers. The last province to be settled by the New Zealand Company was Canterbury. Three years separated the arrival of the first four ships and the establishment of a flour-mill on the Avon River, by Daniel Inwood, in 1853.

In all three settlements flour-mills had been established within three years of the founding of the provinces. Flour-milling was ranked high as a basic industry essential to the well-being of the population. Mills provided both a market for wheat and a supply of flour. Capital was required to build the mills and they were usually brought from England by enterprising millers. Some rushed to build their mills so that return on their investment could be obtained. Others preferred to wait, making sure that the site selected was the best available and grain supplies were going to be regular.

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5 E.N. Harraway. op. cit., p.6.
6 L.T. 16th July, 1853.
TYPES OF MILL

All mills depended on mill stones for grinding the wheat, but variations occurred in the source of power used. There were three alternatives and all had been used successfully in Britain. The most commonly used, both in Britain and New Zealand, was the water mill. Water was used to turn a large wheel from which gears transferred the power to turn the mill stones. After the wheat had been ground the flour and husks were separated by sieving. The other form of power dependent on natural phenomena was wind. Windmills caught the wind in sails which turned, gears then transferred the power to the stones.

Steam was the other form of power that could be used. The steam engine had been invented in the Seventeenth Century and had been refined so that it could be used for powering many types of machinery. The disadvantage in the South Island was that coal had to be used to generate the steam and supplies were not plentiful in the early years of settlement. Before 1864 coal often had to be imported from Britain at great expense compared to the cheapness of water and wind.

As a result the first three mills mentioned earlier were all water-powered as this was accepted as being the most reliable cheap source of power. Brief histories of the development of mills in each of the three provinces show the spread of mills and the necessity to use differing power sources dependent on the available sites.
OTAGO

THE FIRST MILLS

The river known as 'Water of Leith' was the site of the first mill in the township of Dunedin and this river was to be used as the site of the second mill in the town, some ten years later, in 1859.7 It is surprising that the second mill was built so much later than the first as in Christchurch and Nelson new mills were soon built after the first. Possibly lack of suitable sites or even lack of capital caused the gap of ten years. Shortage of grain seems an unlikely reason because in 1859 Otago exported over 61,000 bushels of wheat.8 Prior to the opening of the mill in 1859 it would appear that wheat was being shipped to Melbourne and Akaroa for grinding.9

SITE PROBLEMS IN DUNEDIN

The hilly terrain on which Dunedin was founded meant that water-powered mills often had to have elaborate fluming to carry water to the site of the mill. A flume supported by high trestles can be seen in Plate 1. This was Royse and Stead's mill in the 1880's at Woodhaugh, Dunedin. Such constructions took time and money and were no doubt a limiting factor in early mill development. More suitable streams

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7 E.N. Harraway. op. cit., p.9.
9 E.N. Harraway. op. cit., p.10.
PLATE 1: Royse and Stead's flour-mill in Dunedin in the 1880's illustrates the elaborate fluming necessary to carry water to some mills.

PLATE 2: This wooden flour-mill at Tapanui clearly shows an overshot waterwheel.
were to be found on flat land to the west and south of the town and these areas soon had mills.

TRANSPORT DIFFICULTIES AND WHEAT SUPPLY

Transport in the early years of settlement was difficult and expensive. Rivers did not have bridges and roads were not well formed. Horse drays and bullock wagons were used to transport wheat to the mills but they were limited in the amount they could carry. Many trips had to be made to supply a mill with the 1200 bushels of wheat required weekly.¹⁰ Unlike Christchurch, Dunedin's wheat growing areas were at a distance from the town, to the south at Mosgiel and to the west on the Taieri Plains. The distance that wheat had to be transported encouraged the growth of mills closer to wheat supplies, a trend that continued until transport improved.

EXPANSION BEYOND DUNEDIN

Unlike the other provinces expansion outside Dunedin township occurred while there was still only one mill in that town. From the original settlement settlers moved south and west to the plains that were covered with bush. Existing transport technology isolated these areas from the main centre of population, despite distances of less than 30 miles. Milton in 1853 was nine days travel from Dunedin by bullock wagon.¹¹ This isolation encouraged primary and

¹⁰ George Duncan's mill, founded in 1859 used this amount. E.N. Harraway. p.9.
service industries in towns such as Milton. The name Milton is a derivation of 'Milltown', named so because of the importance of the 1857 flour and oatmeal mill of P. McGill in establishing the town.

It is difficult to know whether a mill was located in an area of plentiful grain supply, or whether the demand for wheat created by a mill resulted in an increased acreage in the surrounding area. In the 1850's mills often preceded large wheat acreages and often had insufficient wheat offered them in their first years. The Tokomairiro district around Milton had only 230 acres of wheat in 1855, which had risen to 619 acres by 1859. The rise in acreage encouraged other mills to be built and vie for the trade in flour. Safe from the competition of mills outside the local area and with adequate wheat supplies, flour mills flourished in the small rural towns of Otago.

DEMAND FOR FLOUR

The market for flour in Otago gained a sudden boost with the gold rushes in Central Otago in the early 1860's. Local production could not match the demand and in 1865 Dunedin imported 8563 tons of flour. While labour frequently left farms and business to join the prospectors, the farmers and millers who could find labour had a prosperous time supplying the miners. Mills out of Dunedin were often closer to the gold fields and therefore had an advantage over Dunedin mills.

12 E.N. Harraway, op. cit. p.18.
13 Statistics of N.Z., 1865, Table 18.
By 1868 mills had been built at Palmerston, Hawkesbury (Waikouaiti), Green Island, Mosgiel, Outram, Port Molyneux and Inchclutha while the first of the Central Otago mills, at Queenstown, had opened.\(^\text{14}\) Otago by 1865 had a population of 46,599 \(^\text{15}\) and it was in response to the demand for flour by this population that mills increased in number. By 1870 the growth of the Otago milling industry had resulted in a surplus of flour for export of 53 tons.\(^\text{16}\)

**VARIATIONS IN POWER SOURCE**

No production figures are available for any of the mills. However, it can be assumed that with the milling technology of the time and by comparison with mills in other provinces, mills in Otago would have had small capacities. Up to 30 tons of flour could be produced in a week. Water was used in Otago wherever possible to power the mills. It was cheap and so had an advantage over steam. Steam power required heavy capital outlay as well as the cost of the coal necessary to fire the boiler. In the small towns of the plains such as Woodside, Outram and Milton suitable streams were present and so water was used to turn a wheel. There is no record of wind being used in South Otago but steam was used in several mills. In the late 1850's such a mill was built at Inchclutha, with another at Milton in 1862 and one in Dunedin in 1867.\(^\text{17}\) Coal was probably obtained from Kaitangata. When powered by steam, mills no longer

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\(^{14}\) Mackay's Otago Almanac. 1868.  
\(^{15}\) Statistics of N.Z., 1865. Table 1  
\(^{16}\) Statistics of N.Z., 1870. Table 19a.  
\(^{17}\) E.N. Harraway pp.19, 27, 26.
needed to be tied to a river but could locate in the centre of towns, or on roads that gave the greatest access for wheat.

NORTH OTAGO

A different climate prevailed in North Otago, contrasting with the wetter areas south of Dunedin. In this way it was more closely related to Canterbury in relief and climate although provincial boundaries include it as part of Otago. The area was to become one of the great wheat growing areas of New Zealand. By 1866 there were some 11,000 acres of land in crops in the Oamaru district, mostly planted with wheat and oats. At this stage only one mill had been founded, a steam mill, built by James Hassell in 1864. In 14 years time there were to be five mills in Oamaru and many in surrounding towns.

The abundant supplies of wheat were the reason for the proliferation of mills and there was soon a surplus of flour for export. In 1870 60 tons were exported but it is believed large amounts were shipped to other parts of New Zealand. Oamaru had a large windmill built on a hill overlooking the town. The stone building was 75 feet high and the sails were able to catch much of the available wind. It appears that suitable water was difficult to obtain in the town of Oamaru and so there was a reliance on wind and steam for powering many of the mills. In the nearby town-

18 K.C. McDonald, History of North Otago, 1940, p.47.
19 Ibid. p.39.
20 Statistics of N.Z., 1870, Table 19a.
21 K. McDonald, op. cit., p.39.
ships such as Maheno, Herbert and Reidston, water power was utilised.

SUMMARY

Dunedin illustrates slow initial growth of the milling industry as a result of site limitations and wheat crops that were not as good quality as had first been believed. The distance between the wheat-growing areas and Dunedin township assisted the growth of milling in small towns on the plains. Where wheat growing was more suitable, in North Otago, once population grew so did mills, producing an excess to the demands of the local population. The gold-rushes, and their associated market, did much to assist the growth of milling in all areas of Otago.

NELSON PROVINCE

INTRODUCTION

Whereas much of the discussion on Otago lacked direct evidence of millers' attitudes and thoughts, the memoirs of an early Nelson miller have been published by his daughters. In this book, the miller, Alfred Saunders, recalls in first person the problems of milling in Nelson. This contemporary viewpoint assists present day interpretation of milling in the 1840's and 1850's.

22 A. Saunders, Tales of a Pioneer, 1927.
PROBLEMS OF MILLING IN NELSON

Alfred Saunders was a founding settler of Nelson colony. He brought with him a flour-mill which he intended to erect but did not start milling immediately. He gave the following reasons -

a. No one was growing wheat that would want grinding.
b. It was not possible to procure a site on which to build a mill or obtain water rights.
c. There was no good water power in or near the town, only in country land that had not been surveyed.
d. There was no good water power anywhere that would not be expensive to utilise and secure.23

While Saunders had the capital and equipment, and there was a market available, these problems of wheat supply and site availability caused him to wait. He observed the failure of the first attempts at milling -

"Before I could see any security for going to work, two companies and two individuals had started building flour-mills, two in the town and two in the country, none of which proved remunerative." 24

MILLS AS A COMMUNITY SERVICE

Between 1843 and 1846 the population of Nelson was between 2,800 and 3,000.25 The demand for flour was so

23  Ibid., p.41.
24  Ibid., p.41.
great in 1844 that leading settlers had formed the Nelson Flour Mill Company with a capital of £500. A mill was built and it performed a community service but never made money for the leasees.26 Once local mills had been established, the price of flour dropped from £35 a ton (1842) to £12 a ton by 1849.27 The bankruptcy of the New Zealand Company and the resulting poverty of the town did little to assist millers and so Saunders temporarily gave up the idea of erecting his mill and went to Australia.

GROWTH OF MILLING

After the first mill had operated 'successfully', another mill was built in 1846.28 Wheat acreage rose to 1339 acres by 1850 29 and a third mill, water-powered, (as the other two had been) commenced operations in 1848. Other forms of power supply were tried after 1850. A steam mill was built in 1851 30 and a large windmill was advertised as ready to grind wheat and other grain on November 8th, 1851.31 This was the situation when Saunders returned to Nelson. He observed the mills spread over Nelson and the nearby country districts and noted -

"not one .... was paying interest on the money it had cost." 32

26 Ibid., p.367.
28 Ibid., p.46.
29 Ibid., p.40.
30 Ibid., p.46.
32 A. Saunders, op. cit., p.87.
SITE PROBLEMS AND POWER SOURCES

Saunders observed that the water mill at Waimea South had no water in summer and could only operate well when the river was running high in winter. The owner knew very little about milling and Saunders saw this as an explanation why few mills operated successfully in Nelson. The mill at Waimea South had its production raised from grinding half a bushel of wheat per hour to nine bushels an hour when the equipment was adjusted properly. The pair of stones would produce about two sacks (360 lbs) of flour each hour the mill was working.

The problem of water supply appears to have been the ruination of many mills. It could be overcome by the use of wind power, which was attempted, but the efforts appear to have met with little success, probably through the unreliability of the wind. The other way of overcoming lack of water and suitable site was by the use of steam as was done in Otago. The mill at Richmond used wind power, when available, and steam power when the wind dropped. Coal of inferior quality was available locally but this was soon exhausted. English coal then had to be bought to power the mill but this proved expensive.

A SUCCESSFULL MILL

As it was practically impossible in the Nelson district to get a perfect combination of wheat supply,

33 Ibid., p.88.
34 Ibid., p.92.
market demand, and water supply at one site, a compromise situation had to be met. Saunders chose for his milling venture a site that was distant from Nelson town but which was ideal in terms of water and grain supply. The site chosen had a mill already but it was known as 'the waterless mill' as the previous owner had never got sufficient water to work it. A new building was built about half a mile below the old mill and Saunders devised a scheme for channelling the river into a steady flow. He named the mill Brightwater, it was about five miles south of Richmond and proved to be the centre of a community that grew up round it.

The mill was kept working day and night in an effort to pay off money borrowed to build the mill. The two pairs of stones ground over 1000 bushels of wheat each week and Saunders apparently had no trouble purchasing wheat or selling flour. While he gristed for farmers, more profit could be made by buying wheat and selling flour. Locally produced wheat must have been expensive compared to Canterbury wheat as Saunders could ship Canterbury wheat in, make flour, and make more profit selling this flour than he could with locally grown wheat. Even more profit could be made by importing wheat from Adelaide and Valparaiso. Imported wheat made a finer quality flour than local wheat and this assisted trade. Through profits made at the Brightwater mill Saunders could afford to send money

36 Gristing was when farmers brought their wheat to the mill and it was ground and the flour returned to them.
37 A. Saunders. op. cit. p.96.
38 Ibid., p.96.
overseas for cargoes of wheat and was the only miller in Nelson who could.

The disadvantage of his site being at a distance from the port and the town of Nelson led Saunders to develop his own carting organisation "to cart wheat to, and flour from, the mill".\textsuperscript{39} As business increased he had 16 horses fully employed carting. Much of his flour appears to have been delivered to customers in the Nelson area, who paid cash on delivery.

Farmers became regular wheat suppliers each season and in 1856 a system of advancing money to meet harvest expenses three months in advance of delivery was begun by Saunders. This ensured regularity of supply and shows the close relationship between the miller and the farmer. There appears to have been no difficulty in obtaining sufficient wheat supplies for the Brightwater mill except in 1859 when high prices in Australia threatened to prevent Nelson wheat from being sold to local millers.\textsuperscript{40} Demand for flour, both in the province and in Wellington appears to have been steady. By 1863 only one rival mill existed in Nelson township.\textsuperscript{41}

SUMMARY

Milling in early Nelson is a story of several mills being erected at unsuitable sites, often by inexperienced men. The few who knew what they were doing and accordingly

\textsuperscript{39} Ibid., p.98.
\textsuperscript{40} Ibid., p.109.
\textsuperscript{41} Southern Provinces Almanac, 1863.
chose a suitable site with a reliable power source succeeded in making a profit. Demand for flour in Nelson, together with the closeness of the Wellington market, stimulated growth. After the first two years of settlement supplies of wheat were plentiful and this, together with the support of the community, made some mills profitable enterprises.

CANTERBURY

INTRODUCTION

Even before the first settlers arrived, the suitability of the Canterbury Plains for mills was observed. Captain Joseph Thomas in his report on the Port Cooper district wrote -

"the smaller streams on the plain may be turned to some account for undershot mills ..... Windmills will in my opinion be in most general use." 42

The Deans Brothers also reported on the suitability of the plains for wheat and flour-milling -

"From the facility with which immense quantities of wheat can be grown, it is of the utmost importance that mills, or the materials for mills, with threshing power attached, should accompany the first settlers; one water and one windmill would probably be sufficient at first." 43

These recommendations were not immediately carried out by the New Zealand Company.

43 Ibid., pp.161-2.
THE FIRST MILL

Three years after the arrival of the first four ships the following advertisement appeared in the Lyttelton Times -

"To Agriculturists

Gentlemen - My Intention of erecting a Corn mill as announced by advertisement last year (which advertisement induced you to cultivate wheat rather largely) equal to the wants of the Colony, has been fully carried out, which the following figures will show. To the present time I have ground 1700 bushels, in the hands of growers there are from 10 to 1300 bushels, making a total of 3,000; the mill is capable of grinding 10,000 bushels per annum, and can in a week be made equal to twice that quantity. To have enhanced the value of wheat 5s per bushel and depressed the price of flour at least £10 a ton is a cause of much self gratulation, and I beg to thank those persons who express their satisfaction at my efforts and give me credit for having done so much to promote the interests of the Canterbury Settlement.

I am, Gentlemen, your obedient servant,

D. Inwood 44"

Inwood believed that he could satisfy the needs of the Canterbury settlement (the 'Colony' in the advertisement) and that the mill had been instrumental in encouraging wheat growing in the area. The suitability of land for wheat and opportunities for the export of wheat may have been a viable alternative to supplying a local mill. The mill however was a great attribute in the community as flour was now available locally at a cheaper price than the imported varieties.

44 L.T. 16th July, 1853.
SITE OPPORTUNITIES

Christchurch was fortunate in having the Avon and Heathcote Rivers flowing close to the town centre. These rivers were both to be used extensively as the sites for mills. The Avon was most favoured as it had a regular flow, little affected by droughts or flooding, because it was spring fed. Inwood for his first mill chose the Avon about one mile from the centre of the town. Hilgendorf traced some eight mills on the Avon River in the years up to 1900. Not all millers took the time to obtain water rights and build the necessary channelling to control river flow. Perhaps having read Captain Thomas' report, others attempted wind-milling.

Only one month after Inwood's advertisement the following notice appeared -

" **Heathcote Windmill**

Mr Charles W. Mountfort has great pleasure in informing Agriculturists and the Public that he is now prepared to Grind and Dress Corn at the charge of one shilling per bushel." 46.

The owner apparently aimed to utilise the sea breezes as his power source. Local crops were available close by; however the mill is never mentioned in local histories or newspaper reports so it must be presumed that it closed down soon after. The problems that wind-mills faced are dealt with later in this chapter.

By 1854 the second mill on the Avon had commenced

45 *Press* 29th Nov., 1930 and 6th Dec., 1930.
operations. It was described as "a powerful water mill" and the owners Messrs Woodford and Stephens advertised that flour and pollard were always on sale at the mill. This mill was to last for about 45 years. Today part of the water race that was used to supply the mill with water can still be seen. Rivers could often not be used directly but had to have a race cut to channel flow. Instead of the usual meander a straight cut across the meander was often made to increase the fall of water and so increase the speed of the water for turning the mill wheel. Only rarely could water wheels be used without alteration of the existing stream flow.

To negotiate the water rights necessary to utilise the river took several years at some sites. Often suitable sites were not used as the prospective mill builder could not afford to wait while the rights were negotiated. Daniel Inwood had his mill operating but saw an ideal site on an island in the Avon River, closer to the centre of Christchurch. The process of obtaining the site dates from the 10th January, 1855 when the island was advertised for sale by the Commissioner of Crown Lands. Not until 1856 was it notified by newspaper that an ordinance would be applied for, from the Provincial Council, empowering Daniel Inwood of Christchurch, a miller, to erect a flour mill. Inwood got permission to dam the river on one side of the island and the mill eventually commenced operation in 1859. (Plate 3). Because the mill was so close to the centre of

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47 L.T. 14th Jan., 1854.
48 L.T. 10th Jan., 1855.
49 L.T. 2nd Jan., 1856.
50 Press 6th Dec., 1930.
PLATE 3: Inwood's mill on the Avon River, Christchurch, was typical of the small water mills in the South Island in the 1870's.

PLATE 4: The windmill, owned by W. D. Wood was a prominent landmark in Christchurch in late 1850.
town it attracted much public attention, not all of it approving. The first traffic jams were created by drays waiting to unload wheat and blocking the road.

The mill was ideally located for marketing flour as it was close to the town. Wheat grew well in the present day suburbs of Christchurch and there were no problems of wheat supply. Transport was easier on the flat land and so transport of wheat in small quantities could be made over longer distances than in the other towns discussed earlier. As the population of Christchurch increased so did the demand for flour.

Farmers often had small windmills used for grinding wheat on their farms but these are never recorded as flour mills. One windmill that attracted much attention, through its size as a landmark and for the quality of its flour, was that belonging to W.D. Wood. This mill was erected in the present day Antigua Street, then known as Windmill Road (Plate 4). The Lyttelton Times described it as -

"the second and much improved attempt in the province to use the power of our regular breezes for grinding purposes." 51

By the 10th September, 1856 the windmill had commenced operations. The design was modern as the sails adjusted to the amount of wind blowing. A high quality flour was promised which would -

"tend to raise the value of Canterbury flour in the markets of the neighbouring colonies." 52

51 L.T. 16th July, 1856.
52 L.T. 10th Sept., 1856.
It appears that the windmill would be producing an excess of flour to local demand and that a market for good flour would be found in other provinces.

The choice of the site for a windmill was not a great success. The Canterbury Plains were too flat to gain exposure to the wind as a higher elevation would have done. The climate of Christchurch was also unsuitable. Windmills were originally used in countries that had a predominating wind all year; however, refinements to windmills had meant that the sails could swing to face the wind. The mill could not work without wind and this appears to have been the problem at Wood's mill. There were too many still nights in Christchurch and wind strength was variable. After six years operation it was sold to Mr Leith of Leithfield, who erected it on a hill there.\(^{53}\)

A lease to a site on the Avon River had been obtained by W.D. Wood in 1861.\(^{54}\) There he built a watermill that was to prove more successful (Plate 5). The site was later to become easily accessible to the railway and milling continued until 1955. Little mention has been made of the use of the Heathcote River, but it appears that only one mill existed on its banks. No details are remaining but it was probably located close to 'Sunnyside'.

This has not been a comprehensive survey of early milling in Christchurch. Evidence of Hilgendorf shows that there were probably several small mills built in the 1860's especially near the headwaters of the Avon River. The discussion of several mill sites in Christchurch shows that

\(^{53}\) *Press*, 6th Dec., 1930.
PLATE 5: W. D. Wood's second mill was on the Avon River which had been diverted to provide sufficient fall of water. The undershot waterwheel can be clearly seen.

PLATE 6: Parr's windmill in Timaru was founded in 1872 and lasted for 20 years.
with plentiful grain, mills expanded rapidly. Wind-powered mills were tried unsuccessfully and reliance was soon completely on watermills. Steam mills were not built in the first two decades because water power was easily obtainable.

AKAROA

The first settlement in Canterbury was not at Christchurch but at Akaroa. French settlers arrived and founded a town in 1840, but a mill was not built until 1852.\textsuperscript{55} It was erected by C. Haylock in Grehan Valley, from which the mill took its name. The stream in the valley was used to drive an 18 feet high water wheel.\textsuperscript{56} Akaroa was an unusual site for a mill as there were no extensive wheat supply areas nearby. Wheat was grown on about 80 acres\textsuperscript{57} but this was apparently supplemented by grain from Otago,\textsuperscript{58} and probably other parts of Canterbury. Flour from Akaroa was of high quality and was shipped to Wellington\textsuperscript{59} where it gained a high price. Akaroa would appear to be an example of a mill with an ideal site, limited local demand for flour and little local wheat. The mill lasted only about ten years, probably as a result of cheaper flour being available from Christchurch.

\textsuperscript{55} George MacDonald Dictionary of Canterbury Biographies. C. Haylock.
\textsuperscript{56} Canterbury old and new, 1850-1900; a souvenir of the Jubilee, c. 1900. p.54.
\textsuperscript{57} Statistics of the Crown Colony Period, op. cit., p.40.
\textsuperscript{58} E.N. Harraway, op. cit., p.10.
\textsuperscript{59} George MacDonald Dictionary of Canterbury Biographies., op. cit.
EXPANSION BEYOND CHRISTCHURCH

The number of mills in Christchurch may have slowed the growth of milling in the small towns outside of the main town. Not until 1857 was the first mill on the plains, outside Christchurch, opened. The Lyttelton Times, January 31st, 1857 reported -

"Wheat harvest has commenced in the neighbourhood of Kaiapoi and the crops are good. Mr Woodford's mill will be in operation in about a fortnight and will be a great boon to farmers there, as under present circumstances no export can be looked for." 60

The mill was evidently going to be the main market for the farmers' wheat. Mr Woodford had been one of the partners in the Carlton Mill (in Christchurch) but had left to begin his own mill close to new wheat-growing areas.

It was not until April 11th that the mill was opened, 61 considerably later than promised. Water powered the mill and wheat was ground at the same price as the Christchurch mills, one shilling per bushel. There were numerous small streams between the Waimakariri and Ashley Rivers which were to be utilised for milling by several men, after Woodford's lead. The area, with very fertile land, was able to soon support large numbers of mills, two of which still exist today. Flax mills also abounded in the area and some flour mills combined the two occupations - stripping flax by day and grinding flour by night.

To the south and west of the town of Christchurch

mills followed the spread of the agricultural frontier. R.G. Cant\(^{62}\) has shown the spread of settlement, and flour-mills were built soon after settlement. Between 1864 and 1875 mills were opened at Leeston, Irwell, Lincoln and Southbridge\(^{63}\) to utilise the local grain. The small output of mills and the expense of transport by horse and cart explain why mills were located in the towns that served the local agricultural area. Much of the flour produced was consumed locally although in the areas between the Waimakariri and Ashley Rivers there must have been excess flour production available for shipping elsewhere.

**SOUTH CANTERBURY**

By 1865 South Canterbury had become settled and wheat was grown in sufficient quantities to support flour-mills. "Flour had been imported in large quantities in 1864, Chilian or Adelaide flour costing 5d a lb., and the ¼ lb. loaf costing 1/6."\(^{64}\)

Wheat acreage in the area had risen from 177 acres in 1861 to 2455 acres by 1867\(^{65}\) and in 1864 a mill was opened at Milford,\(^{66}\) to the east of Temuka. The area around Temuka, which was the centre of the agricultural district, was supporting three mills by 1868. All were water-powered.

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Further south at Timaru there was not such an availability of water power and the first mill, in 1868, was powered by steam. This mill was also used for timber working. The second mill in Timaru was founded in 1872 and was powered by wind (Plate 6). It was to last for 20 years. Timaru provided a market for the flour produced but there was also the advantage of port facilities which was to lead to great growth of milling in the 1880's. Despite lack of water power, an area such as Timaru became a milling centre through access to wheat and the advantages offered by a port location.

**SUMMARY**

Not all areas of the South Island have been discussed in this chapter. Those selected have been chosen because they illustrate the requirements of mills in terms of population, wheat supply and available sites, together with the decisions that mill owners had to make when locating their mills. Where wheat could be grown the settlers were anxious to have a local mill, even if it involved forming a public company to build it. Mills depressed the price of flour and also assisted local farmers by providing a market for their wheat. As the agricultural frontier spread away from the first towns, mills followed. Soon most towns in wheat-growing areas had their own local mill, supplying

67 Ibid., p.410.
68 Ibid., p.410.
their needs. Once a mill was established other buildings often grew up around it, forming a township.
CHAPTER III

A PERIOD OF INNOVATION 1870-1885

INTRODUCTION

In 1882 two innovations were introduced into New Zealand which were to change the flour-milling trade. The introduction of the roller mill and the impact of refrigeration on farming patterns were combined with the earlier development of the rail network (see Fig. 1), to alter the pattern of mill locations. The full effects of these three innovations were not to affect locational decisions until after 1885. This date has been chosen as significant because it marks the culmination of a 'developmental' period of milling, from whence the industry enters a 'refinement' period.

The date 1885 was selected for the first map of locations because at that date statistical and directory data is available on an island scale. There were about 90
flour-mills in the South Island, spread over 60 towns. ¹
These have been plotted on a map to show the pattern of
distribution (Fig. 1). This map may not reveal the exact
pattern of mill locations, but does show the towns that
probably had mills about that date. The rest of the chapter,
after a brief analysis of the pattern, is devoted to
outlining the significance that the innovations had on mill
locations and economic structure.

THE SOUTH ISLAND MILLING PATTERN, 1885

The map (Fig. 1) shows mills located in the large
towns of the east coast but the number of such mills is far
less than the number in small towns that served small local
agricultural areas. Mills are widely dispersed throughout
the whole of the area where wheat was grown. This is
revealed by the overlay to the map of wheat acreages by

¹ This number and the distribution of mills is based on
listings in Wise's Postal Directory 1885-6. It does
not correlate with the 77 grain mills listed in
'Statistics of New Zealand' for that year. The latter
source includes mills for grinding oats which would
further reduce the number of flour mills counted for
statistical purposes. There are several possible
explanations for the discrepancy in numbers and these
are outlined below:-

a) the directory may list mills that have recently
gone out of production with a time lag between
collection of data and date of printing.
b) A double listing of mills may occur under owner's
name and again under the trade name of the mills.
c) Mills that employ less than two full time staff,
or those run in combination with another business,
e.g. farming, are not counted for statistical
purposes.
d) Some mills apparently closed down when flour prices
were unprofitable for mill operation or when wheat
supplies were short. These mills will still
probably appear in directories but may not appear
in statistics.
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<td>1</td>
<td>Riwaka</td>
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<td>2</td>
<td>Motueka</td>
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<td>3</td>
<td>Upper Moutere</td>
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<td>4</td>
<td>Nelson</td>
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<td>5</td>
<td>Richmond</td>
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<td>Hope</td>
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<td>Brightwater</td>
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<td>Spring Creek</td>
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<td>Kaikoura</td>
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<td>Leithfield</td>
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<td>Woodend</td>
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<td>12</td>
<td>Rangiora</td>
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<td>Southbrook</td>
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<td>Russells Flat</td>
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<td>Malvern</td>
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<td>Ohoka</td>
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<td>20</td>
<td>Kirwee</td>
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<td>21</td>
<td>West Melton</td>
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<td>22</td>
<td>Hororata</td>
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<td>23</td>
<td>Christchurch</td>
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<td>24</td>
<td>Lincoln</td>
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<td>Irwell</td>
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<td>26</td>
<td>Southbridge</td>
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<td>27</td>
<td>Ashburton</td>
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<td>28</td>
<td>Winchester</td>
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<td>29</td>
<td>Temuka</td>
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<td>30</td>
<td>Pleasant Point</td>
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<tr>
<td>31</td>
<td>Timaru</td>
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<td>32</td>
<td>Waimate</td>
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<td>33</td>
<td>Ngapara</td>
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<td>34</td>
<td>Oamaru</td>
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<td>35</td>
<td>Maheno</td>
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<td>36</td>
<td>Herbert</td>
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<td>37</td>
<td>Naseby</td>
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<td>38</td>
<td>Ophir</td>
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<td>39</td>
<td>Luggate</td>
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<td>40</td>
<td>Arrowtown</td>
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<td>Frankton</td>
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<td>42</td>
<td>Palmerston</td>
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<td>43</td>
<td>Waikouaiti</td>
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<td>44</td>
<td>Dunedin</td>
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<td>45</td>
<td>Outram</td>
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<td>46</td>
<td>Woodside</td>
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<td>47</td>
<td>Milton</td>
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<td>48</td>
<td>Evans Flat</td>
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<td>49</td>
<td>Tapanui</td>
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<td>Gore</td>
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<td>51</td>
<td>Mataura</td>
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<td>52</td>
<td>Balclutha</td>
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<td>53</td>
<td>Waitapeka</td>
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<td>54</td>
<td>Winton</td>
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<td>55</td>
<td>Otautau</td>
</tr>
<tr>
<td>56</td>
<td>Gummies Bush</td>
</tr>
<tr>
<td>57</td>
<td>Riverton</td>
</tr>
<tr>
<td>58</td>
<td>Invercargill</td>
</tr>
</tbody>
</table>
DISTRIBUTION OF FLOUR-MILLS 1885-6

Flourmill location
Railway lines (1882)

Scale
0 20 40 60 80 miles

FIG 1
counties (Fig. 2). There were no mills in counties where wheat was not grown and the area just to the north of Christchurch, where there was the greatest concentration of mills, also had one of the highest wheat acreages.

Areas discussed already in Chapter II experienced further growth in the number of mills. Nelson, Canterbury and Otago provinces account for the majority of mills. The gold-rushes in the 1860's and 1870's had created both a demand for foodstuffs and, on their decline, a surplus of labour that often turned to farming. This explains the growth of milling in Central Otago and the adjacent areas of Southland and South Otago. Milton had five mills in 1885, more than any other town, and they thrived on wheat from the Tokomairiro Plains.

Mills prior to 1885 had been essentially local in their sphere of wheat purchases and flour sales. To save farmers having to cart wheat over long distances to mills, new mills were started. This in turn stimulated farmers in the vicinity to grow more wheat. While this was the pattern in most country mills and many town mills, some excess of flour to local needs was produced. This was shipped to the North Island or exported. Wheat was exported in large quantities in the 1870's and 1880's, but flour also added to New Zealand's export earnings. Of the 58,743 tons \(^2\) manufactured in the South Island in 1885 some 4,800 tons were exported. Destinations included the United Kingdom, Australia, Brazil and the Pacific Islands. Only 405 tons, out of a total production in the North Island of 16,000 tons,

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were exported. A breakdown of port data for the year 1885 shows Dunedin as the chief exporting port.

Table 1: **Flour exports by Ports 1885**

<table>
<thead>
<tr>
<th>Port</th>
<th>Tons exported</th>
</tr>
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<tbody>
<tr>
<td>Lyttelton</td>
<td>1606</td>
</tr>
<tr>
<td>Timaru</td>
<td>481</td>
</tr>
<tr>
<td>Oamaru</td>
<td>225.5</td>
</tr>
<tr>
<td>Dunedin</td>
<td>2476</td>
</tr>
<tr>
<td>Bluff</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4838.5</strong></td>
</tr>
</tbody>
</table>

Exports fluctuated, depending on local demand, the availability of shipping, and droughts overseas which often affected the ability of other countries to produce wheat. In 1882 the South Island exported the largest quantity of flour in the period under consideration - 9,440 tons. Some of the larger South Island mills had found markets in the North Island, where demand exceeded the amount of flour that could be supplied by local mills. The South Island mills had already begun to be suppliers of the North Island market.

TRANSPORT REVOLUTIONISED

Railways were first introduced in the South Island in 1863 with a line between Christchurch and Ferrymead, at the mouth of the Heathcote River. They spread rapidly in the 1870's under Sir Julius Vogel's policy of public works that

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gave employment, and opened up new land for agriculture. By 1882 they had spread over much of the South Island (Fig. 1). Prior to their introduction both the market area for flour and, more importantly, the source area for wheat, had been limited. Carts and wagons were slow. Compared with railway wagons they could carry very little wheat (Plate 17). Communications that had previously relied on the sea for long distance freight transport and horses (or bullocks) for short hauls, were revolutionised by railways.

The products handled by mills were bulky and it was for this reason that railways became important in mill economies. Delivery of wheat was made cheaper and easier for both the farmer and the miller. Instead of the farmer carting direct to the mill he could now take his grain to the nearest railhead (Plate 16) from where it could often be railed straight to the mill door. Railways were not used solely for joining the main towns but were frequently constructed to provide cheap outlets for agricultural products. Feeder lines ran from the agricultural land to connect with the main trunk line running from Christchurch to Invercargill. Areas that were flat were frequently suitable for cropping and also ideal for building railways as construction costs were lower than over hilly terrain. The Canterbury Plains provide a good example of feeder lines running from the foothills to the coastal line.

Mills responded to railway development by either relocating alongside a railway, or by building a private siding that enabled wagons to be shunted to the mill door. Wheat could be unloaded under cover, allowing movement in any weather conditions. While there were numerous mill
closures after 1885 there were several new mills built. They took the transport situation into account and often chose to locate alongside a railway line with their own private siding. A good example of this is D.H. Brown and Son who commenced milling in Christchurch in 1890.

Mills often did not just rely on flour for their income. Small country mills were sometimes only a sideline of farming, others stripped flax or were combined with saw-milling. City flour-milling establishments were often produce agents and grain merchants, exporting wheat and other grains to Britain. These firms gained greatly through railways and the associated private sidings. Often oatmeal was produced by flour mills as an extra source of income and this was most prevalent in the south of the island, where oats grew better than wheat.

Railways provided a means of sending flour cheaply to areas where previously transport costs had prohibited sales. In this way small mills were frequently faced with competition from larger mills that produced a better quality flour. Purchasers of flour were offered a choice that they had never known before. Country mills that produced a surplus to local demand, and a good quality flour, could rail to ports for shipment to other parts of New Zealand. In areas of plentiful grain supply these mills could buy up local wheat cheaply, mill it and through rail and ship, transport the flour to distant markets at competitive prices.

New areas of farmland were opened up for more intensive agriculture after railways had been built. Previously land that had been away from the coast and its ports had not been intensively cultivated. With improved
access, disposal of weighty products, such as grain, was possible. In the 1870's the grain growing area expanded as a result of high prices, the high fertility of the virgin soil and the ease with which wheat could be transported to ports. Because flour deteriorated during travel, more than wheat, the latter was exported to Britain in larger quantities than flour.

The effect of railways on the economies of mills depended on how far mills were from the nearest line. Those that could afford to obtain a private siding were best off through advantages gained in the handling of wheat and dispersing flour and by-products. Others, that were located at a long distance from a railway, such as the mills at Arrowtown, Luggate, Naseby and Ophir, continued to mill profitably because of isolation from competition. They were however limited in their market as only local needs could be supplied cheaply. Worst off were the mills situated five or ten miles from the railway, or even less distance. The mill at Leithfield was left at a distance from the railway, and the nearby town similarly declined when the railway by-passed it. Many mills were placed in a situation where the railway was less than a mile away, but a private siding could not be afforded, or was strategically impossible due to obstructions in the path of the intended siding. These mills, together with those further away, were faced with the expense of double handling for both the wheat and flour which had to be transported by rail.

Railways had an important effect on mill locations after the introduction of roller mills. It was not until then that large volumes of wheat had to be transported to
mills, with similar quantities of flour, bran and pollard also requiring transport to the ports. In large mills rail access became vitally important.

MILL TECHNOLOGY ADVANCES

Before 1882 all New Zealand mills had relied on mill stones to turn wheat into flour. These stones could cope with only a limited quantity of wheat, in an hour. A pair of mill stones, four feet and six inches in diameter and driven at 120 revolutions per minute, would grind 200 lbs of flour in an hour. This was the quantity in a sack of flour. Flour is often measured in short tons of only 2,000 lbs and so, in theory, it took ten hours to grind a ton of flour. The stones, however, had to be constantly cleared of blockages and periodically 'dressed'. This process of grinding the grains of wheat into constituent parts was replaced by the introduction of steel rollers to do the breaking down. As a result the internal structure of the mill had to be altered considerably.

MOTIVE POWER

Mill stones had been turned by power obtained from wind, water and steam. Each type of power source had its advantages. Wind-powered mills did not need expensive alterations of river flows, did not require water rights and were safe in floods. They did however need a steady wind of about 20 m.p.h. for best service. Market demands

5 This was the process of recutting the grooves in the stones.
required continuous operation as an economic necessity. The
time of wind was usually unreliable and the miller had to be
prepared constantly to utilise what wind there was, even at
night. As a result windmills were not used extensively and
the maximum number of commercial windmills in the South
Island would have been only about five.

Water was utilised to turn water-wheels which then
transmitted power mechanically to the mill stones. This
form of power had site problems as outlined above, however,
once a suitable site had been found and secured there were
several advantages to wind power. As long as the water
supply was constant a smooth and even grind could be
obtained. The water-wheels used were overshot, with water
flowing over the wheel (Plates 1 and 2); undershot, with
water flowing under the wheel (Plates 3 and 5); or of a
breast type with the wheel lying horizontally. The type of
wheel was selected according to the terrain, with undershot
wheels used on flat land and overshot wheels supplied by
flumes at hilly sites. The choice of type of wheel had to
be made by the miller, bearing in mind the characteristics
of site and river flow.

Sites for water-mills were limited by the nature of
many of the rivers and the distances from the nearest town.
Often towns grew around mills as mills were constrained by
site requirements while other service industries were not.
In the late Eighteenth Century the steam engine had been
invented utilising fossil fuels to generate steam that had
potential energy. By the late Nineteenth Century these
gines had been developed and refined so that they provided
a reliable source of power. Labour demands of mills using
steam were increased through the need for an engineer, while, unlike the air and water which was free, the coal for fuel was often expensive. Transport costs of coal could also be expensive if mills were not on a railway.

Steam-mills had an advantage over water-mills, because they were flexible in their site requirements. Over windmills they had the advantage of continuous power supply. Only the expense of coal and the original plant, together with the cost of maintenance prevented their more widespread use. Water-mill owners often found their mills marooned in disadvantageous locations away from ports, the main markets, and transport routes, especially railway lines. The South Island in 1886 had 28 steam-mills compared to 49 water-mills, although four used steam and water. Wind power accounted for only one mill.\textsuperscript{6} Steam was gaining popularity, especially in areas close to a coal mine.

THE ROLLER MILL

In 1882 the first roller mill was erected in Timaru.\textsuperscript{7} The principle of the roller system was that a series of steel rollers gradually reduced the grain. Once the wheat had been elevated to the top of the mill, gravity carried the wheat through the stages of processing. The rollers reduced the wheat gradually as the gaps between the rollers in a series got narrower. There was a planned sequence of operations and machinery was used to such a degree that

\begin{itemize}
  \item \textsuperscript{6} Statistics of New Zealand, 1886, p.290.
  \item \textsuperscript{7} J.C. Andersen, \textit{op. cit.}, p.411.
\end{itemize}
labour requirements were reduced, comparative to the amount of flour that could be produced by a roller mill.

The roller mill, according to experts, and apparently the public, produced superior flour to mill stones. It was of consistent quality as the machinery was highly adjusted and did not clog with wheat, as the stones had done. The skill of the miller working at his craft had to some extent been replaced by the skill of the engineer in maintaining the machinery at optimum performance levels. While at first there was some reluctance on the part of millers to accept rollers as being superior to stones, progressive men soon realised the advantages of the new type of mill. Those that could afford to rapidly changed to the roller system.

Capital was required for the plant and buildings. Some millers adapted the building that had been used for stone grinding by adding extra storeys. The first roller mill in Timaru was a new mill, built after fire had destroyed the previous building that had housed stones. It was 75 feet high, with six storeys, a far bigger building than had been necessary for stone milling. The usual size for these latter mills had been only two storeys. A surprisingly large number of mills seem to have been able to find the finance necessary to convert to rollers. They were, however, not all such massive buildings as the Timaru mill, and roller plants could be obtained that produced only slightly more flour than the average stone grinding mill.

Steam had to be used to power the larger roller mills, but for the smaller plants (up to six sacks per hour), water power was often sufficient. Many millers still persevered with stone mills and a few were built after 1885. Stone
mills survived in country areas where there may not have been sufficient capital to be able to convert to rollers. These millers continued to produce one or two sacks of flour per hour, which was sufficient to meet local demands.

Flour production from roller plants had potential for being far greater than that possible from stones. The width of rollers, which determined capacity, could be varied according to millers' requirements, and the power source available. The Belford Steam Flour Mill, the second mill to introduce rollers, also in Timaru, had a capacity of seven sacks of flour per hour. This mill was a 'reconstruction' of the previous stone mill and was obviously converted to rival the product of the earlier roller mill. Only a year separated the two mills and by 1890 several other South Island mills had changed to the roller process.

The introduction of the roller mill revolutionised the structure of the industry, especially as it was often allied with the use of steam for power. Mills could locate at points where they gained the maximum advantages from transport routes and nearby markets. Steam-powered mills often located close to railways for the easy intake of wheat and because the roller mill could produce hundreds of tons of flour in a week and required outlets for this flour. In the next chapter it will be shown which areas were favoured for large roller mills.

8 J.C. Anderson, op. cit., p. 410.
THE IMPACT OF REFRIGERATION ON FARMING PATTERNS

In the same year as the roller mill was introduced to New Zealand, the first shipment of frozen meat was sent to England. There had been a wheat boom in Canterbury and North Otago which began in the 1870's and continued into the 1880's. This boom was a product of a surplus of labour left after the gold rushes, high prices of wheat, low wool prices and little demand for mutton. The plains produced high yields on the virgin soils that brought great profits. New areas had been opened in the 1870's as a result of the introduction of the double-furrowed steel plough, which could plough the tussock areas of the Canterbury Plains.

Before 1882 reliance had been placed on wheat and wool for agricultural income. These products, though bulky, could be easily exported and did not deteriorate with travel. Refrigeration meant that meat could now be exported to Europe and as a result farming became diversified. Sheep were bred for their mutton. Many farmers chose to mix farm, rotating wheat with pasture for animals. The result was that wheat acreages were considerably reduced.

Refrigeration came at an ideal time for farmers as the high yields were falling. Wheat prices had also fallen in the early 1880's as a result of increased production in other parts of the world. New Zealand wheat prices were closely tied to the ruling rates overseas. Farmers could not afford to replace the nutrients in the soil that had been depleted by over-cropping. They were therefore keen to turn to animals as a way of maintaining their profits.

Much of the wheat had been produced on large estates but refrigeration, coupled with government legislation, was to encourage smaller farms. The year 1883 was to be the peak year for wheat acreages in the period up to 1890. By 1885 Canterbury's production had fallen from 6,360,000 bushels, two years earlier, to 4,460,000 bushels. By 1886 only 2,844,000 bushels were grown. The situation in Canterbury illustrates what was happening throughout the South Island wheat-growing area. In areas where wheat did not grow well, but could be grown, farmers were keen to change to more profitable farming which was now possible. The drop in production of wheat affected exports only, at first, but was later to affect supplies of milling wheat. Mills that had abundant local wheat offered for purchase were later to find insufficient quantities available locally to meet their requirements.

Harraway in his thesis stated -

"Without doubt the changing character of farming had most to do with the decline...... of the milling industry" in country areas. This is partly true but would not have occurred if transport had not been altered by railways, nor if the production of mills had not been greatly increased by the introduction of rollers. These mills often required large quantities of wheat which required a large supply area. Disadvantageous siting in terms of railway access and market access were important although shortage of wheat was a

10 D.B. Copland, *Wheat Production in New Zealand*, 1918. Table XXXIX.

contributing factor. The local wheat offered was often not suitable for milling and inferior flour produced from such wheat was not competitive.

The phenomena of the closing of small agricultural industries was not occurring solely with flour mills. Golledge\textsuperscript{12} noted a decline in country breweries and malt-houses, attributing it to "improved transportation and increasing populations (that) encouraged larger firms to increase their output."\textsuperscript{13} H.D. Watts\textsuperscript{14} writing on the decline of agricultural industries in rural areas of the East Riding after 1872 noted a fall in numbers of malting factories, iron foundries, breweries and mills. The decline of mills in country areas was "encouraged by transport developments, (and) precipitated by technological changes. The introduction of the roller mill in 1883 offered a major challenge to the miller using the traditional methods."\textsuperscript{15}

\textbf{SUMMARY}

The three technological innovations that were to affect the forthcoming distribution of mills had been introduced by 1885. They worked in unison to cause the closure of many mills after that date. It is impossible to gauge what the reasons for many mill closures were or why mills located at similar sites were able to continue. Only

\begin{itemize}
\item \textsuperscript{13} \textit{Ibid.}, p.8.
\item \textsuperscript{15} \textit{Ibid.}, p.121.
\end{itemize}
the business histories of the many small mills would reveal the true reason for closure. The base had been laid by the three innovations for a redistribution of mills into a new pattern which was to evolve by about 1910.
CHAPTER IV

ROLLER MILLS TAKE OVER 1885-1900

INTRODUCTION

While there had been little change in the total number of mills operating between 1885 and 1900, the effects of the innovations of the years preceding 1885 were beginning to be felt. This is best shown by a province-by-province description which reveals the contrast between the small mills serving local needs and the large ones, usually using rollers, that had been forced into a wider search for markets both in the North Island and overseas. Lack of information prevents a description of every mill operating in 1900 and leads to a bias towards the larger mills as these were most written about in contemporary books of the time.¹

To assist in understanding the pattern of the distribution of mills in the South Island a map was constructed (Fig. 3) based on listings of flour mills as they appeared in Wise's New Zealand Post Office Directory² for the year 1900. Comparison of this map with the map of

¹ The Cyclopaedia of New Zealand, volumes 3, 4, 5 were used as the main source of information in this chapter.
² Wise's New Zealand Post Office Directory, 1900 was used to plot mill locations. Because of the doubtfulness of some of the sites listed, confirmed sites are differentiated on the map (Fig. 3).
KEY TO FIG 3

1. Motueka
2. Upper Moutere
3. Nelson
4. Richmond
5. Hope
6. Wakefield
7. Brightwater
8. Spring Creek
9. Blenheim
10. Amberley
11. Waikuku
12. Woodend
13. Rangiora
14. Cust
15. Southbrook
16. Ohoka
17. Kaiapoi
18. Christchurch
19. Templeton
20. Annat
21. Darfield
22. Kirwee
23. Lincoln
24. Irwell
25. Southbridge
26. Brookside
27. Chertsey
28. Ashburton
29. Wakanui
30. Waterton
31. Winchester
32. Temuka
33. Kerrytown
34. Pleasant Point
35. Timaru
36. Waimeate
37. Ngapara
38. Oamaru
39. Shag Valley
40. Reidston
41. Herbert
42. Naseby
43. Ophir
44. Luggate
45. Arrowtown
46. Frankton
47. Palmerston
48. Waikouaiti
49. Dunedin
50. Mosgiel
51. Outram
52. Milburn
53. Milton
54. Balclutha
55. Waitepeka
56. Waiwera South
57. Ettrick
58. Evans Flat
59. Lawrence
60. Mandeville
61. Waikaia
62. Otautau
63. Gummies Bush
64. Riverton
65. Wyndham
66. Invercargill
DISTRIBUTION OF FLOUR-MILLS 1900

KEY
○ Confirmed locations
○ Unconfirmed locations

Scale
0  20  40  60  80 miles

FIG. 3.
the 1885-6 distribution (Fig. 1) shows that while the number of mills had changed little there had been redistribution in the location of mills. New mills had opened in some towns, adding to the number, while in others, mill closures had been experienced. In some areas new mills had been built utilising the latest developments in roller-mill technology while many others had modernised their plant and buildings. Such internal changes are not revealed by the map.

NELSON PROVINCE

According to the map (Fig. 3) there were seven mills operating in the province. It is significant that in four cases some other activity was carried on in association with flour-milling. At Richmond, the mill established in 1864\(^3\) was used primarily to supply the local bakery in the adjoining building. Flour was sold throughout the local district,\(^4\) but no mention is made in the 'Cyclopaedia of New Zealand' of sales in other provinces. A mill, established in 1865\(^5\) at Wakefield, was still operating in 1900. The owner of this mill was a storekeeper and this was probably the main outlet for flour from the mill.

A four-storey mill, built of corrugated iron at Motueka, was run in association with a saw mill. The steam engine that was used produced only 12 horsepower\(^6\), a small unit compared with the 80 horsepower engines used in Timaru mills. Roller

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3 *Cyclopaedia of New Zealand*, vol. 5, 1906. p.126.
machinery had been installed but grind stones were still being used, probably to increase production. The brand of flour produced was known as "Kapai" and found "a ready sale wherever it is offered to the trade or public".7 Flour was milled, and flax stripped, in the mill at Brightwater, a town shown in the previous chapter to have been founded round the mill. No further details are available on this mill or on the other mills in the region.

Nelson province was isolated from the rest of the South Island as shipping provided the only freight links with other provinces. Wheat grew best on the Waimea Plains and this is the area in which mills were most dense. The trade of each mill was essentially local and the mills were small as a result. It would appear that only one mill had converted to rollers and the rest still supplied stone-ground flour.

MARLBOROUGH

The major problem of wheat cultivation in this province, the 'liability of summer drought', 8 made it a risky crop. Sufficient wheat was grown in 1900 to support three mills. Two were located in Blenheim, the capital of the province, while the other was just north at Spring Creek. This latter mill was owned by Redwood Brothers and in 18859 they had built a roller system into the mill.

7 Ibid., p.232.
9 Cyclopaedia of New Zealand., vol.5. op. cit. p.376.
Water power continued to be used for the five sack per hour plant. The mill had its own wharf from which cargoes of flour were sent to Wanganui, Foxton and Wellington at regular intervals. Demand exceeded supply as the flour was noted for its quality. The owners of the Spring Creek mill extended their business to Blenheim when they bought an existing mill from its previous owners. The practice of owning two mills was unusual at this time.

It would appear that while there were only three mills serving Marlborough there was an excess of production to local demand. This was shipped outside the province, and the closeness of lower North Island ports, together with the quality of the flour produced, made sales easy.

CANTERBURY

Flour-mills in this province ranged in size from large roller mills in Christchurch and Timaru producing 15 x 200 lb sacks of flour per hour, to small water-powered mills, still using mill stones to produce only one sack per hour, as at Woodend. These were the two limits of the spectrum but the average mill had a capacity of about five sacks per hour. Canterbury shows the greatest contrast in milling types and sizes of any of the provinces at this time.

Christchurch, the major centre of population in the province, had only three mills in 1900. One of them belonged to Wood Brothers. They had first established a windmill but when wind-power proved to be unsatisfactory a

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10 A.D. McIntosh, Marlborough A Provincial History, 1940, p.295.
new mill was built at a site on the Avon River. The water-power there proved insufficient for a large mill and some time soon after 1880 steam was used to supplement the water-power. The stones could grind six sacks of flour per hour, a large production for this type of mill.

Rollers were introduced in 1889, but these were small and produced only five sacks of flour per hour. "The demand for the new 'roller' flour was so great that the mill could not cope with it by working twenty-four hours a day, six days a week." In response to the demand, the owners decided that further expansion was necessary, and in view of the terms of the lease of the Avon site it was decided to build a new mill. Subsequently a new mill was built at Addington in 1891.

The Addington mill (Plate 8) was on a railway siding, as the Riccarton mill had been, but was situated at the junction of the north and south lines. The roller plant incorporated was the most modern available and steam was used as the sole source of power. The railway siding enabled wheat to be brought to the mill door and similarly the 60 tons of coal used every month could be railed direct to the site. By 1900 the mill was producing 7238 tons of flour a year and did a lot of export trade. The capacity of the new mill was far greater than the mill on the old site as 15 sacks an hour could be produced.

11 Wood Brothers Centennial Narrative, p.6; The whiteness of the new type of flour appealed to customers previously accustomed to a greyish coloured flour.
12 Ibid., p.6.
PLATE 7: Extensions had been made to the Riccarton mill of W. D. Wood by 1890, to incorporate a roller plant. A railway siding extended to the mill door.

PLATE 8: Wood Brothers new mill at Addington was a much larger building. While it was on a railway siding horses and drays were still used for local deliveries of flour.
At Wood Brothers' previous site, Richard Allen had taken over the mill and its lease (Plate 7). The water turbine was used as the main source of power in an effort to keep costs low. The other mill in Christchurch had been built in 1892 by D.H. Brown (Plate 9) and this mill is still in operation today. The owner had previously been the manager of the mill at Ashburton and he chose a railway site not far from Wood's mill at Addington. It used the roller process and by 1897 had a capacity of ten sacks per hour. Flour was sent to the West Coast as well as the North Island, and was widely advertised in newspapers and magazines of the day.

Christchurch mills illustrate site response to changing market demands and transport methods. Wood Brothers found the site at Riccarton cramped and so to increase production a new mill had been built. D.H. Brown, owner of the other mill built in the 1890's, chose a site favourable to rail access and with room for expansion. Christchurch was a favoured location for mills because of the local market; the accessibility of wheat supplies from the north, west and south; and rail access to the port of Lyttelton. Production of flour from the three mills was large and could not be consumed locally. Consequently, location of mills near a port provided a convenient outlet to the North Island and overseas.

Steam was used in the three mills, although at Allen's mill only as a supplementary power source. This

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16 Ibid., p.344.
17 Ibid., p.342-3.
ensured continuous power supply and greater power could be obtained for turning the machinery. Moir and Company had a similar combination of steam and water in their mill at Southbrook. Their steam engine produced 80 horsepower compared to the water-wheel's 14 horsepower.\textsuperscript{18} Rollers and stones were both used and it is presumed that the water power was used to turn the stones while the rollers were turned by steam. Production of flour was in the following proportions:

\begin{itemize}
  \item 10 tons roller flour every 24 hours
  \item 4 tons stone ground flour every 24 hours.\textsuperscript{19}
\end{itemize}

Smaller mills appeared to work 24 hours per day to try and match the production of larger mills.

If a mill was using rollers for the production of flour it did not necessarily mean that the capacity of the mill was greatly increased. Roller plants varied in size and had to be selected by the miller, according to the size of the building they were to be installed in and the type of power that was available. At Brookside mill the roller plant produced only 12 tons of flour a week.\textsuperscript{20} The mill sold locally with excess being carted to the railway, which was about three miles distant. From the railway, flour could be dispersed to other towns and to the port of Lyttelton. The mill was still powered by a 16 feet high water-wheel\textsuperscript{21} which explains its distance from the railway, as the river was three miles away.

\begin{footnotes}
\item[18] Ibid., p.344.
\item[19] Ibid., p.344.
\item[20] Ibid., p.685.
\item[21] Ibid., p.685.
\end{footnotes}
Another mill three miles distant from the railway was the Wakanui Mill. The high transport costs and inconvenience of carting to rail eventually led to a transfer of site, just after 1900, adjacent to the railway line. The mill at the Wakanui site had originally been favoured with high wheat yields (73 bushels per acre)\(^\text{22}\) and a good water supply. The advantages offered by a rail site after the opening of the Rakaia rail bridge convinced the owner that there was a need to relocate in Ashburton town. The Wakanui mill is more fully discussed in Appendix II.

Some mills were limited in their production capacity by the size of the stream used to turn the water-wheel. If the miller was unable to afford a conversion to steam and rollers he had to continue using the grind stones for producing the flour. In 1900 the water-mill at Woodend, built in 1856, continued to use stones rather than rollers. The five horsepower wheel turned stones to produce only one sack of flour per hour.\(^\text{23}\) Many other mills of a similar size must have existed in Canterbury and other provinces. Many still gristed for the local farmers. It does appear that several of the country mills did convert to rollers, examples of this include mills at Darfield, Kaiapoi and Rangiora.\(^\text{24}\) By 1900 the majority of the city mills were using rollers to be competitive in the markets to which they had access. Because many country mills thought they had sufficient trade to justify conversion to rollers, over-production frequently

\(^{22}\) Ibid., p.810.  
\(^{23}\) Ibid., p.450.  
\(^{24}\) Ibid., pp.741, 432, 469.
occurred in some areas.

A mill that illustrates insufficient power available from a river, after conversion to rollers, is Canterbury Roller Flour mills at Ashburton. In 1889 rollers were installed\textsuperscript{25} and a steam plant was required to supplement the water-power. A capacity of ten sacks an hour was achieved\textsuperscript{26} after the installation. Ownership of the mill changed a great deal up to the year 1900 and the bank owned it after financial difficulty in 1880. Wood Brothers Ltd of Christchurch owned the mill in 1900, but it was run independently of the Christchurch mill.

South of Ashburton at Winchester and Temuka were two roller mills of two and a half and five sacks per hour respectively.\textsuperscript{27} They both continued to use water-power which was sufficient as the plants were small. Public demand for roller flour had forced the change from stones to rollers. Mills in these two towns have survived to the present day despite the closeness of the large Timaru mills.

Timaru had three large mills, all using rollers, including what the owners claimed to be the largest mill in New Zealand. The Timaru Milling Company Ltd (Plate 10), whose mill had been built in 1884, had a capacity of 25 sacks per hour.\textsuperscript{28} As local demand for flour was small, most of the output had to be shipped to other parts of New Zealand, or exported. For flour sales the mill had established agencies or branches in all principal cities and towns of

\textsuperscript{26} Cyclopaedia of New Zealand, Vol. 3, \textit{op. cit.} p.830.
\textsuperscript{27} Ibid., pp.892, 906.
\textsuperscript{28} Ibid., p.1017.
New Zealand. Export trade was mainly to Queensland and New South Wales where demand was reported as 'steady'.

The Atlas Roller Flour Mills (Plate 11) had been built in 1888 and the latest roller machinery had been incorporated during its construction. The mill was run in association with a Dunedin mill and between them production was 330 tons of flour per week. Flour from the Atlas mill was sent throughout New Zealand and also to New South Wales, Queensland and Western Australia. The third mill in Timaru, the Belford Mills, was slightly smaller (Plate 12) and had been a stone mill until it was remodelled in 1883.

Comparison of the three plates (10, 11, 12) shows the variation in size and the closeness of the railway sidings in all three mills. The tall smoke stacks show their reliance on steam as all three were powered in this way. Timaru probably had the largest milling capacity of any town in the South Island at this date. Railways had contributed to the growth of milling in Timaru as they provided access to the wheat fields north and south. The nearby port was the other significant factor in the strength of the industry, as much excess production had to be sent elsewhere.

When considering possible locations for flour-mills in the 1880's millers had to decide between a site close to port or market, or one close to the source of grain. While Timaru millers chose sites that were close to port, with ease of rail access, Waimate had a mill built because of the

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29 Ibid., p.1017.
30 Ibid., p.1015.
31 Ibid., p.1015.
PLATE 9: The Brookfield Roller mills owned by D. H. Brown and Son, was built in 1892 close to the railway.

PLATE 10: The largest flour-mill in the South Island in 1900 was owned by the Timaru Milling Company.
PLATE 11: The Atlas Roller Flour Mills in Timaru

PLATE 12: The other Timaru mill was the Belford flour mill. All three Timaru mills were close to the railway.
closeness of wheat supplies. The mill was established in 1890,\(^{32}\) close to the railway which was used for transporting flour to the port of Timaru. Small quantities were sold locally in Waimea.\(^{33}\) It would appear that port locations were better as the Waimea mill had closed by 1936.

NORTH OTAGO

While not a province, North Otago is closely related in wheat-growing characteristics to Canterbury and the pattern of mills was similar to the province discussed above. Milling was centred on the town of Oamaru which had a similar position to Timaru. It was a port and had rail links with the area to the north-west and south. Bruce and Company's mill there produced a brand of flour known as 'White Spray', which was well known throughout the country with the main agency in Wellington.\(^{34}\) The mill had been converted to rollers in 1897 and was still powered by a large water-wheel, some 34 feet in diameter.\(^{35}\)

Water was also used to power Ireland and Company's mill at Oamaru, through the use of a turbine. Up to 50 horsepower could be obtained from it, which was sufficient to drive a five-sack roller plant.\(^{36}\) The flour sold readily in Auckland, Wellington and Dunedin. Two mills were owned by J. and T. Meek, one powered by steam capable of producing ten sacks of flour per hour and the other by water,

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32 J.C. Andersen, *op. cit.* p.412.
34 *Cyclopaedia of New Zealand*, vol. 4, 1905, p.546.
producing four sacks per hour\textsuperscript{37} (Plates 13 and 14). The former mill is still in operation today.

Most of the other North Otago mills were located near the coast, with the exception of the mill at Ngapara. Palmerston had a two-sack roller mill that supplied local buyers, with the surplus going to Dunedin.\textsuperscript{38} Steam was used in this mill when there was insufficient water to turn the water-wheel. On the Kakamui River, at Reidston, a roller mill produced three and a half sacks per hour. Similar to Palmerston, flour was sold locally, and in Dunedin.\textsuperscript{39} There were three mills in Dunedin at the time but strangely no details are published in the 'Cyclopaedia of New Zealand'.

CENTRAL OTAGO

Small pockets of fertile land in this area produced high yields of wheat, especially in the first years of cropping. Towns were often close to these fertile areas and they provided the market for the locally produced flour. At Arrowtown the three mills appear to have survived after the gold rushes, when demand for flour stimulated local production. Frankton had a small mill, as did Naseby. The latter mill obtained wheat from the Maniototo Plains and used a small roller plant to produce two sacks of flour per hour. The business had been founded in 1877 and, while water from the Government water race was used most of the time, a

\textsuperscript{37} Ibid., p.546.
\textsuperscript{38} Ibid., p.445.
\textsuperscript{39} Ibid., p.468.
PLATE 13: The Crown Roller Mills, Oamaru, were owned by J. and T. Meek.

PLATE 14: Meeks also had a large elevator for storing wheat. It was supplied by both railway and traction engines.
steam engine supplemented it when water was scarce.\textsuperscript{40} Luggate had a mill which was to survive until 1941, utilising the wheat produced on the Hawea Plains.

SOUTH OTAGO AND SOUTHLAND

Mills in this area were scattered in numerous small towns. The lack of port sites and the size of population, together with the low yields of poor quality wheat (which was related to climatic conditions), encouraged many small mills rather than large mills located for exports and North Island supply. These small mills usually only produced sufficient flour for local needs. The largest mill was Fleming and Gilkinsons' in Invercargill which had been established in 1877.\textsuperscript{41} It was driven by an 80 horsepower steam engine and had a capacity of six sacks per hour,\textsuperscript{42} still small compared to the large mills of Canterbury. The owners expanded their business into the smaller towns north of Invercargill, with mills being built at Gore and Winton.

To the north of Invercargill at Otautau there were two mills. One of these had a roller plant which produced two sacks of flour per hour. This flour was well known throughout Southland \textsuperscript{43} although there is no record of shipments out of the province. Oats grew better than wheat in Southland and South Otago and so many mills probably rolled oats, with flour as a sideline. The mill at Lawrence,

\begin{itemize}
  \item \textsuperscript{40} Ibid., p.615.
  \item \textsuperscript{41} Ibid., p.855. The owner was later Fleming and Co.
  \item \textsuperscript{42} Ibid., p.855.
  \item \textsuperscript{43} Ibid., p.965.
\end{itemize}
for example, produced five tons of oatmeal and three tons of flour a day. Rollers had not been installed until 1898.\textsuperscript{44}

**SUMMARY OF MILL DISTRIBUTION IN THE SOUTH ISLAND ABOUT 1900**

The miller had a wide choice in sites, types of mill and methods of power supply. Those who wanted to be competitive needed a roller mill; but these varied in size according to the size of the market, the type of power available, the size of the building and the financial resources of the miller. Small roller plants could continue to use water-wheels that had been used for stone grinding. Large mills generally required steam to gain the power necessary to turn the rollers.

Mills that had capacities over ten sacks per hour all used steam power and they were concentrated in the East Coast towns of Christchurch, Timaru, Oamaru and Dunedin. Significantly these towns were all ports, or close to ports, as well as the major centres of population. These towns were ideally situated for taking in wheat from a wide area, which smaller country mills were not, as rail links with their hinterlands were good. Mills in these four larger towns did a lot of trade in the North Island and the largest mills shipped flour to Australia. The smaller country mills also did some inter-island trade, while the mills still using stones appear to have catered only for local needs. Many were still gristing for farmers and presumably had little spare for sales that were other than local.

\textsuperscript{44} Ibid., p.688.
A detailed analysis of the changes in mill locations has not been possible because of the unreliability of evidence available in Wise's New Zealand Post Office Directory. The internal changes within the industry and the variations between the types and size of mills is much more significant. Frequently when new mills were built they were larger than the small mills that closed down. The slight difference in the numbers of mills between 1885-6 and 1900 does not show that the total production capacity of flour was increasing as a result of replacement of stones by rollers. In the years following 1900 it was realised that this production was far in excess of the country's needs and so many mills were to close in the face of competition and the resulting unprofitability.

COMPETITORS TO SOUTH ISLAND FLOUR MILLS

Australia had extensive wheat-growing areas and the mills there were often capable of producing flour cheaper than the New Zealand product. They looked to New Zealand as a market for this flour. The New Zealand Government looked unfavourably on this flour as increased imports would have affected the milling and wheat-growing industries.

A Tariff Commission met in 1895 to hear evidence for the necessity of increasing or decreasing tariffs on various products. One product considered was flour. The existing duty on imported flour was £1 per ton, yet

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Australian flour still entered the country and found a market. While it could not compete in the South Island towns where wheat was milled, Australian flour sold competitively in the North Island and West Coast.

Much imported flour was coming into the Palmerston North area and the flour-mill there wished to be protected by a prohibitive duty on such flour. It was maintained that prices of flour would not be raised by such an action as "local competition would be sufficient to keep the price down". 46 Transport costs from Australia to the North Island and to the West Coast of the South Island were as cheap, if not cheaper than sea transport from the South to the North Island. Australian flour, being cheaper and with similar transport costs, could sell competitively despite the duty, as it produced more loaves of bread per sack than South Island flour. It was obvious that if the duty was removed flour would become cheaper, but this advantage had to be weighed against the effect such an action would have on New Zealand mills. The Government decided to maintain the duty.

In 1901 the problem of imported Australian flour was considered again. At this time New Zealand was considering federation with Australia. The effect on many industries was considered by a Royal Commission and flour-milling was again investigated. Evidence was given that the milling trade was in "a particularly bad state at the present time, and to have any other competition coming in would be decidedly a bad thing for trade." 47 There were already too

46 Ibid., p.335. The term 'local' probably referred to 'New Zealand'.
many mills in New Zealand and the loss of any trade, as was most likely if federation occurred, would have brought many mills to an end. While federation was decided against, the problem of over-production continued. It was evident that in the following years the millers would have to rival one another for trade, or find some solution to the problem of over-production.
CHAPTER V

CONTROLS IN THE MILLING INDUSTRY 1900-1936

INTRODUCTION

The factors that influenced the location pattern of mills in the period were diverse and frequently incalculable. It has therefore been necessary to analyse the period chronologically in order to show the efforts of millers to control production, reasons for unprofitability of mills, problems of wheat supply, changes in transport methods and the effect of competition from imported flour. All these factors, as well as others, affected the location and number of mills, often indirectly. At two points in this chapter a map and analysis of mill locations has been constructed to show the changes in the pattern that had occurred under the pressure of the contributing factors. None can be directly attributed to causing a mill's closure. Details of a specific mill are available through the survival of letter books for parts of the period and this case study is referred to in the text, but the bulk of information is included as Appendix II.

THE NATURE OF THE FIRST CONTROLS

Flour-milling in New Zealand about 1900 has been shown in the previous chapter to have reached a state where
there was little profit for millers. The competition between mills had become fierce, and bad debts and price cutting meant many mills had a bleak future. Mills in the South Island, competing for a small local market, were worst affected. If such conditions continued it would be a case of the mills with the most capital surviving while the smaller mills slowly went insolvent.

With an uncertain future ahead the New Zealand Flour-millers' Association was formed on March 1st, 1901. The document that millers signed is reprinted in the Appendices to the Journal of the House of Representatives. Analysis of this contract shows the objective to be the combination of millers in New Zealand so that commercial costs could be minimised. All mills that belonged to the Association were to have sales of flour, bran and pollard arranged for them by the body. Agents of the Association in all major towns would replace the duplication and expense involved through each mill having its own travellers. Each associated mill was not permitted to produce as much flour as they wished, but each was allocated sales as a proportion of the sack capacity of the mill. In this way it was hoped over-production would be removed, and all mills would obtain a share of the available trade. Mills would no longer have to worry about marketing their flour or incurring bad debts.

THE FLOUR MARKET

By 1900 most town dwellers purchased their bread from bakers rather than baking their own requirements. The

primary use of flour has always been for baking bread and in 1900 the chief market was provided by the bakers. Competition between bakers frequently led to closures, resulting in bad debts for millers. Another problem was that bakers sometimes bought flour from one mill, then off a different mill, not paying either. Bad debts occurred because of the enthusiasm with which mills greeted customers, to the extent that risks were taken when the financial position of bakers was doubtful. The problem of bad debts was removed when mills joined the Association, as the latter was responsible for collecting payment for flour.

Millers often followed the practice of forward selling flour. This was the situation when a baker contracted to buy his flour from a mill for up to a year in advance. If the price of wheat increased during the time of the contract the mill was often selling at a loss. If, on the other hand, the price of wheat, and subsequently flour, fell, the baker often wriggled out of the contract by threatening never to do business with the mill again unless the price of the contract-ed flour was lowered. It had been hoped that the Association would do away with such practices and that all sales would be for immediate delivery at the ruling price.

The problems of bad debts and forward sales had been a result of competition between mills for the limited market. The consumer had often benefitted as competition kept prices of flour at the lowest possible level. Price cutting between mills was prevalent, with large orders or cash payment receiving a discount. In efforts to drag customers away from other mills cheaper flour was offered, and many mills frequently sold flour at a loss. If the Association
had been successful a monopoly could have been created with
the Association acting as one large mill. The limited
success, however, meant that the pattern of mill location
was only slightly distorted, comparative to that which would
have occurred if the Association had not been formed. Mills
still closed down through unprofitability.

FAILURE OF THE ASSOCIATION

The Association was really a failure because several
mills refused to join. These mills thought they could do
better competing against the associated mills and producing
as much flour as they were able. Each associated mill had
been allocated a production figure of flour per month, but
there were complaints over the fairness of this allocation.
Mills that had previously worked 24 hours a day found
production was limited to eight hours. Those mills that had
always worked eight hours found little change under the
Association, but had costs reduced considerably. Some mills
tried the organisation but thought they could make more
profit on their own and so left.

It is difficult to know exactly how many mills there
were in the South Island at any one time, or how many
belonged to the Association. In September, 1901, about 33
mills belonged\(^2\), mostly located in the South Island. In
1903 there were about 50 mills in the South Island,\(^3\) which
closely agrees with the number of confirmed mills on the

\(^2\) A.J.H.R., 1903. I.10. Evidence of George Jamieson,
General Manager of the N.Z. Flour-millers Association, p.2.
\(^3\) Ibid., p.7.
map (Fig. 3), and with statistics of grain mills. Many of the smaller mills that gristed only, or did not sell as competitors to the Association, may not have been counted by Jamieson. It is reasonable to assume that prior to the Association's formation at least 50 mills were competing for the market, and the most within the Association in the South Island was 30. Over 20 mills were 'free' and competing with the Association.

LARGE AND SMALL MILLS

In 1901, as today, the larger mills which were located in Auckland, Dunedin, Timaru, Christchurch and Ashburton could have produced all the flour needed in New Zealand. This would have required 2½ hour operation each day but this was possible, and probably the most economical method of running a mill. If trade had been in the hands of these mills then there would have been no need for the smaller mills, often located in country towns, to exist. Small mills did have advantages. Even in districts that had poor wheat quality or insufficient supply of local wheat, good wheat from other areas could be mixed with the local product to produce good flour, cheaply. In this way local farmers were encouraged and local flour was cheaper than flour shipped in from other areas. Consumers often benefitted when small mills were kept working.

4 Statistics of N.Z., 1902, p.424 lists 57 grain mills in the South Island.
6 Ibid., p.75.
A large number of mills had three or four sack plants while the largest was about 15 sacks.\(^7\) A capacity of four sacks per hour meant that in a 40 hour week some 16 tons of flour would be produced. Mills of this size did not have much of their production available for shipment. There was a justified fear that if mills of this size were closed and flour production was concentrated in the hands of a few large mills, then wheat prices could be controlled, as could flour prices. The Association kept in business many of the small mills that would have been forced to close if production had not been limited.

METHODS OF SELLING FLOUR

Before the Association had been formed each mill had been responsible for selling the flour it produced. Customers within the mill's hinterland had been built up, but when production exceeded local demand sales had to be arranged in other towns. Travellers were hired to conduct this business, or alternatively, agents were appointed in other towns. Belonging to the Association removed the cost of travellers, as one agent represented the associated mills in each major town. Association travellers and agents competed with the travellers of unassociated mills for trade. Often large mills such as A. Steven and Company of Dunedin (which produced 530 tons a month),\(^8\) remained outside the Association as the volume of their production meant they could afford to hire travellers.

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The agents of the Association took the orders for the area in which they worked, and the buyer nominated the brand required. The order was then sent to the mill for fulfilment. The charge for the service was a commission paid to the Association on each sale, amounting to five per cent. Many mills were satisfied with the service of the Association and bitter towards those mills that had prevented its success by remaining outside. The control over the flour-milling industry was limited to about half the milling capacity of the country and so the Association was unsuccessful in fulfilling its aims.

THE GOVERNMENT ENQUIRY

Much information so far in this chapter has been obtained from evidence submitted to the Extension of Commerce Committee in 1903, during its enquiry into millers' activities. The enquiry followed accusations that the Association had been formed to raise the price of flour by limiting production, and that through co-operation with the bakers association the price of bread would be raised. In the evidence submitted by members of the milling trade and bakers, the state of the industry is revealed.

The main problem areas appear to have been in Christchurch and Dunedin where associated mills battled with unassociated mills, each undercutting the others' prices. The situation was further complicated because associated mills refused to supply bakers who would not join the bakers association. One baker was forced to import Canadian flour.
flour, as well as obtaining supplies from Auckland, to keep in business. From evidence it was proved that there was no written agreement between the bakers' association and the millers' association, and that problems were often created through the unreliability of some bakers' finances. Those selling cheap bread were often not financial businesses.

As a director of the Association said -

"It was... of vital importance to the millers that the bakers should charge fair and profitable rates for bread, as unless they do so there is considerable risk of contracting bad debts."  

GOVERNMENT DECLINES TO ACT

If all mills that existed had produced flour 24 hours a day, as they were capable of, New Zealand mills would have been producing about three times the country's flour needs. There was practically no export trade as a result of a duty being placed on flour imports to Australia. Consequently it was logical to limit mills to a third of their production capacity by fixing quotas. This would prevent the mills that were longest able to bear the profitless situation taking control of the milling industry after competitors slowly closed.

If, on the other hand, all mills had joined together in the Association, with no control by Government, it would have been possible for the organisation to control wheat and flour prices, so that the public was affected by higher

prices for bread. Fear of this situation had led to the enquiry. The possibilities in the future were -

a) Unrestricted competition among mills, forcing many out of business.

b) The majority of mills becoming associated, thereby creating a virtual monopoly situation.

c) Continuation of the situation as it existed in 1903 with free mills and associated mills competing thereby keeping flour prices at the lowest possible level.

d) Some form of government intervention.

The Committee, after hearing the evidence, decided that it did not have any remedy for the situation as it existed and chose to leave it to Parliament to decide the best course of action. In their report the Committee stated -

"The evidence given before the Committee discloses the evils possible on the one hand under unrestricted competition, and on the other under the iron rule of combination; but your Committee is unable to recommend a remedy for so difficult a problem, and submits the evidence taken by it to the House." 11

The Government decided to leave things as they were, consumers were obtaining cheap flour and it appeared there was little risk of all mills combining. The Association continued to operate as before, with a little more care not to combine with bakers.

THE WAKANUI MILL

Records exist from one mill that existed in the early 1900's that was a member of the Association. Located three miles east of Ashburton it is typical of a country mill, isolated from the main markets but producing flour in excess of local demand. The surplus was largely a result of competition from a mill in Ashburton, as the two had to share local trade. Records extracted from the letter book of the mill, together with explanations of their significance, are included in this study as Appendix II. They illustrate the problems that millers faced and also provide information on quantities shipped and sold locally in the first years of the Twentieth Century.

THE PATTERN OF MILL LOCATIONS IN 1913

By 1913-14 figures obtained from three sources all give a similar number of flour-mills in the South Island. The location of the 51 mills are shown in Figure 4. It appears that many of the mills that were unconfirmed in the 1900 map (Fig. 3) definitely did not exist by 1913. The small mills that had gristed only, or were part-time businesses carried on with farming, flax milling or some other trade had closed. Competition from roller flour had reduced the demand for stone flour as by 1915 there were only 30 pairs of stones in operation in the South Island, compared with 315 sets of rollers.

13 Statistics of New Zealand, 1918. p.104 (for 1915 year)
Wheat shortages, which affected flour production at the Wakanui mill in the heart of a wheat-growing area, may have been a major factor in closures but it is impossible to assess. Techniques of production, selling procedure, and the necessity of capital for plant and the purchase of wheat when it was plentiful, were also important for the change of mill locations. Larger mills in ideal locations show that the practice of flour-milling had changed from a local trade to an industry.

Nearly a third of the mills were situated in Christchurch, Dunedin, Timaru and Oamaru, which were the main towns close to the wheat-growing areas, but were also ports. Country mills in Canterbury and North Otago were not far from ports and this factor, together with the closeness of wheat, seems to explain how these mills continued. There was a trend towards only one mill surviving in country towns where previously two or three mills had existed. Milton, Arrowtown and Cust provide good examples of this. The greater capacity of the roller mill, together with a declining rural population, meant that the needs of a town could be satisfied by one roller mill where previously two or three stone mills had been necessary. Declining wheat production often resulted in grain being available locally in sufficient quantity to supply only one mill.

MILL PROFITS

The Millers' Association and the flour-milling industry in general again came under attack from the Government in 1912 when a Royal Commission on the Cost of Living
was held. As part of the proceedings flour-millers and flour salesmen were called to give evidence on the cost of flour and ways that the cost could be lowered. Price fluctuations in flour were shown to be directly linked with the price of wheat, which in turn was controlled by the price that wheat obtained in London. Profits on flour were generally agreed to be low and figures were produced showing the profit on a ton of flour -

Table 2: Profit per ton of flour in 1912

<table>
<thead>
<tr>
<th>Costs</th>
<th>£</th>
<th>s</th>
<th>d</th>
<th>Income</th>
<th>£</th>
<th>s</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 bushes of wheat at 3/8d</td>
<td>8</td>
<td>16</td>
<td>0</td>
<td>1 ton of flour at 8/10/- (less discount)</td>
<td>8</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>10 sacks for flour</td>
<td>5</td>
<td>10</td>
<td></td>
<td>½ ton bran</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>4 sacks for offal</td>
<td>2</td>
<td>6</td>
<td></td>
<td>1/6th ton pollard</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Railage, cartage, etc.</td>
<td>7</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>11</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of manufacture</td>
<td>10</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>1</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance</td>
<td>4</td>
<td>8</td>
<td></td>
<td></td>
<td>10</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Out of the balance of four shillings and eight pence had to come interest on capital, rates, insurance, and other expenses. Gardner maintained that the miller made very little profit. Low profitability and losses forced several

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15 Ibid., p.104.
mills out of business in the first and second decades of the Twentieth Century. It is important to note that very few new mills opened between 1900 and 1925, although there were movements to new sites. An example of this is the move of the mill from Naseby to Ranfurly, which was on a railway.

THREAT OF IMPORTS

One possible method of reducing the price of flour was by importing the commodity from Australia. Much evidence given before the Commission was not backed up by figures but most witnesses suggested that the Australian miller was working with a larger capital and 'better conditions', and could more than compete with New Zealand millers if the duty was removed. The duty in 1912 was still £1 per ton. Millers were agreed that if the duty was removed, Australian imports would practically wipe out the milling industry in the whole of New Zealand. Only a few country mills, situated at a long distance from a seaport, would be able to survive.

The New Zealand milling industry was protected by the duty in the interests of preserving employment for the millers, wheat growers and the thousands associated with the cartage of wheat and the servicing of farmers' needs. By 1917, import figures reveal the extent of competition from imported flour despite the £1 duty.

From Table 3 it can be seen that considerable quantities of flour were imported into the main wheat-growing areas, especially Canterbury, although little wheat was imported to that province. Millers were well aware of the
Table 3: Flour and Wheat Imports, 1917

<table>
<thead>
<tr>
<th>Port</th>
<th>Flour in centals (100 lb)</th>
<th>Wheat in centals (100 lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>83,475</td>
<td>143,837</td>
</tr>
<tr>
<td>Wellington</td>
<td>69,282</td>
<td>97,167</td>
</tr>
<tr>
<td>Lyttelton</td>
<td>23,262</td>
<td>2,796</td>
</tr>
<tr>
<td>Dunedin</td>
<td>4,900</td>
<td>160,934</td>
</tr>
<tr>
<td>Others</td>
<td>10,709</td>
<td>44,857</td>
</tr>
</tbody>
</table>

competition from imported flour and the manager of Robertson and Company, Ashburton, the mill that had been transferred from Wakanui, wrote to another miller -

"If the government do not act promptly in regard to the importation of Australian and Tasmanian flours the millers here will not require to purchase Australian wheat as the continued large importations of flour are paralysing the local millers trade." 17

New Zealand millers obviously preferred to have Australian wheat, rather than flour, imported to make up shortages, but understandably Australia wanted to sell as much flour as possible, rather than wheat.

CHANGING MILL TECHNOLOGY - A NEW POWER SOURCE

One of the major factors affecting cost of production of flour by mills was the source of motive power. Water power was cheap but unreliable, while steam incurred the expense of coal. When electricity became available many mills saw advantages in utilising such a power supply.

17 Letterbook, 30th July, 1917.
The letter below shows evidence of the mills' enthusiasm -

"To Mayor of Councillors,  
Ashburton Borough Council,

Gentlemen,

Re Lake Coleridge Electric Power. As soon as the power is available we beg to apply for 50 hp for the purpose of driving our flour and oatmeal mills, providing of course that the price of such power is reasonable.

Yours faithfully,
Robertson & Co."  

The first South Island flour mill used electricity for powering the mill about 1907 and by 1910 some six mills were using the new form of power. At this stage water was the most popular form of motive power, with steam close behind. By 1922 electric motors were used over twice as much as steam engines or water power. The greatest advantages of electricity were the reduction in cost of power per ton of flour produced and the improved quality of output through the constant unvarying speed at which the electric motors turned the main shaft. Table 4 shows the variations in cost between electric power and the former power source, in seven sample mills.

From Table 4 it can be seen that in most cases the introduction of electricity brought a significant reduction in power costs for mills. Also evident is the great variation in the amount that was spent by mills on power. This was often unrelated to the capacity of the mill. The

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18 Letterbook, 8th December, 1917.
19 Statistics of New Zealand, 1912, p.580.
20 Ibid., 1921, p.27.
Table 4: Variations in Power Costs between Seven North Canterbury Mills 21

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sack capacity per hour</td>
<td>12</td>
<td>20</td>
<td>12-15</td>
<td>4-7</td>
<td>6</td>
<td>6</td>
<td>10-12</td>
</tr>
<tr>
<td>Cost per ton electric power</td>
<td>1s8d</td>
<td>1s5½d</td>
<td>4s</td>
<td>1s4d</td>
<td>3s3d</td>
<td>1s8d</td>
<td>8s4d</td>
</tr>
<tr>
<td>Cost per ton former power</td>
<td>1s8d</td>
<td>4s0¼d</td>
<td>5s3d</td>
<td>2s4d</td>
<td>-</td>
<td>6s</td>
<td>15s0d</td>
</tr>
<tr>
<td>Approx. no of 8 hour shifts per day</td>
<td>3</td>
<td>2</td>
<td>1 &amp; 2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1 &amp; 2</td>
</tr>
</tbody>
</table>

Use of electricity also reduced the chance of fire in mills. The amounts of dust that were present in mills often meant that there was a fire hazard and many had used electricity for lighting purposes several years before it was used as motive power. Fire had destroyed several mills, especially those built of wood. Hitchcock concluded his address -

"Generally speaking, the introduction of electrical power has probably benefitted the flour-milling industry more than any other industries. From the nature of the business, it is able more effectively than most industries to secure the full benefits of electric power. Apart from the more directly evidenced economic benefits, it has resulted in a greater degree of cleanliness in the mills, and more healthy conditions for operatives, particularly where it replaced some of the older producer gas plants.... probably sufficient has been shown to justify the claim that the advent of electric power has been the most important event in the operation of the North Canterbury flour-mills since their inception." 22

21 E. Hitchcock, Electricity applied to flour-milling in North Canterbury, 1924. p.4.
22 Ibid., p.15.
While electricity affected internal operation, it had a less marked impact on geographical location of mills. Most sites could be reached by electricity power lines and as supplies became available from supplying authorities mills were converted.

CHANGING TRANSPORT 1900-36

Railways had become widely used by the beginning of the period under consideration. They continued to be used for middle and long distance haulage of both wheat and flour. Mills that wished to send flour to other parts of the country, via a port, or those that were forced to transport wheat over long distances for supplying the mill, had to be near a railway. The Wakanui mill, previously referred to, was considered by the owner to be so disadvantageously situated that in late 1904 he decided to bodily shift the mill into the town of Ashburton, close to the railway. This eased cartage problems to rail, as flour had to be sent to the port of Lyttelton for shipment.

Country mills often relied on traction engines for obtaining wheat from neighbouring farms. Plate 15 shows the volume of wheat that could be carried - about 200 sacks in this case. It is believed that farmers paid the cartage costs of wheat to the mill, or could alternatively cart it themselves, using horses and drays (Plate 17). In areas remote from mills, horses and drays were used until the 1920's for carting grain to the nearest railway station, where it was often stored (Plate 16). Local flour deliveries were by horse and wagon but railways were important for long distance movement as was coastal shipping.
PLATE 15: Traction engines were used for short hauls of wheat

PLATE 16: Drays laden with wheat at Lyndhurst railway station. A large grain shed is in the background.
PLATE 17: The horse and dray were limited in the amount of wheat that could be carried to mills.

PLATE 18: In the 1920's wheat was carted to some mills by motor lorry.
PLATE 19: The motor lorry was also used for the distribution of flour and by-products from the 1920's onwards.

PLATE 20: Railway bulk flour tanks can be loaded at mills for the supply of North Island bakeries. This photograph was taken at D. H. Brown and Sons mill.
for inter-island trade.

The motor lorry was used increasingly after the 1920's for both collection of wheat and delivery of flour, a practice which has continued to the present day. Plates 18 and 19 show the truck owned by a mill at Cust that was used for both purposes. The development in the 1930's of sealed roads meant that traction engines were limited in the weight they could carry on such roads and this, together with the economy of the motor truck, spelt their demise. Over the whole period it appears that mills on rail sidings that could draw wheat from a large hinterland were in the most favoured locations, as country mills often had shortages of local wheat.

WHEAT SUPPLY PROBLEMS

Ashburton was the centre of a large wheat-growing area and so it can be presumed that when problems of wheat supply affected mills there most other mills in the South Island would experience similar difficulties. Since 1900 wheat acreages in the study area have fluctuated greatly and most mills have experienced problems with wheat at times. Often wheat grown was high yielding but unsuitable for milling unless mixed with a better quality wheat. The Ashburton mill of Robertson and Company (ex Wakanui mill), after several complaints about flour quality, was forced to apply for Australian wheat -

"So far as flour is concerned it seems to us that there is not much chance for us to compete against the Dunedin and Oamaru mills who are using nearly
all Australian wheat, in some cases all Australian.
The trouble with the flour has practically ruined
our Napier trade...." 23

A letter applying for 20,000 bushels of Australian
wheat at five shillings and tenpence had been lodged on
August 20th, 1917. 24 This wheat was to improve the quality
of the flour and to fulfill orders, but delivery was several
months following the application, after many customers had
been lost.

Port mills received the bulk of wheat imports as they
were favoured to access and required large amounts. It
appears from the following letter, that the Government
refunded the cost of railage of imported wheat to country
mills in some years -

"The position is that we have double railage to pay,
viz; from Port to Ashburton on wheat and Ashburton to
Port on flour, whereas city millers have only to pay
railage on flour.

We therefore beg to make application to you to put us
on a par with other millers by refunding us the
railage from Christchurch to Ashburton on our
purchases of Australian wheat, which has been done in
past seasons." 25

When such subsidy was not given, as in the years after 1920,
country mills were placed at a considerable disadvantage
compared to city mills.

The Arrowtown and Luggate mills, both owned by William

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23 Letterbook, 26th Sept., 1917. Letter of Napier agent
24 Letterbook, 20th August, 1917. Letter to Board of Trade.
Reid, were perhaps the most isolated country mills. Although small, they also experienced problems of wheat supply. In a letter to Mr W.A. Bodkin, M.P. several years later the owner recalled -

"in common with the rest of New Zealand there was a shortage of wheat grown in our districts, and the cost of Australian wheat landed at our mills did not permit of our using a very large quantity." 27

Wheat was landed at Bluff and the cost of transport to the mills had to be met by them. An order from them for 3000 bushels of Australian wheat 28 can be compared with 15,000 29 bushels ordered by Ireland and Company of Oamaru in the same month. The size of the latter mill was no doubt responsible for the amount of wheat required, but it appears shortages were experienced throughout the country.

THE DISTRIBUTION OF MILLS 1925

Country mills had been placed at a severe disadvantage because of their distance from ports and the resulting expense of railage of imported wheat, and flour. The map (Fig. 5) clearly shows the concentration of milling production in the port towns. These mills were clearly larger than those in the country. Of the 37 mills in existence 20 were in Canterbury, which was only one less than the number of mills there in 1913. The greatest number of closures had been in North Otago and Southland, although Dunedin still had

26 They produced about 15 tons of flour each per month.
27 I & C Files, 26/143/11, 18th July, 1936.
28 I & C Files, 26/143/11, 23rd June, 1925.
29 I & C Files, 26/143/13, 26th June, 1925.
DISTRIBUTION AND SIZE OF FLOUR-MILLS 1925

KEY
- Mills over 3,000 tons
- Mills 1,000-3,000 tons
- Mills under 1,000 tons
- Mills not in Distributors

Scale
0 20 40 60 80 miles

FIG 5
the six mills that were present in 1919. Explanation for closures must be looked for largely in terms of unprofitability resulting from lack of local wheat, together with an over-production by small mills that were close together.

The situation that had developed by 1925 was, in economic terms, inefficient. Wheat was being shipped to the South Island, milled, and then much of the flour was shipped to North Island markets. Imported wheat could have been milled much closer to these markets. The technique of mixing Australian and local wheat, and the large fluctuations in South Island wheat acreage, meant that no mills moved away from the South Island to be closer to the market. Imported wheat was often cheaper than local wheat and port mills could sometimes mill Australian wheat more profitably than local wheat.

Profits varied considerably between mills. Factors such as cost of motive power, age of machinery, location in relation to wheat-growing areas and distance from market or transport routes, were important. Many mills that had closed had been adversely affected by at least one of the above factors. Despite closures, over-production was still present and millers tried once again to control their industry.

A SECOND ATTEMPT AT A UNION OF MILLERS

In late 1922 mills were invited to join a sales agency known as Distributors Ltd. This organisation was formed for the same reason that the New Zealand Flour-millers' Association had been formed - to get millers to
accept a voluntary reduction in their output so that over-capacity of mills could be controlled. It worked on a commission basis and agents were established for selling flour in each town. Millers seemed more receptive to the organisation as the majority joined. The only major opposition came from Auckland mills. Figure 5 shows that only two South Island mills did not belong. These two were at Blenheim and Richmond and had outputs of only 498 and 371 tons of flour, respectively.

Distributors Ltd ran into trouble in the same way that the earlier Association had done. Complaints of a monopoly situation in the milling industry, that unduly raised the price of flour, resulted in court action against the Company. Eventually, after a hearing before the Privy Council, a verdict was heard in favour of Distributors Ltd. and they were free to continue business. Once again mill locations were distorted through the survival of many mills that would have closed if free competition had continued. By the 1930's there was discontent by member millers over dwindling sales of flour as a result of new mills opening and competing with Distributors Ltd' mills.

THE RISE OF NEW MILLS

Between 1900 and 1930 competition within the flour-milling industry was severe and profits of mills generally low. The capital required to build a roller plant that would be competitive with established large volume mills was

30 Press, 18th September, 1934. p.10.
31 I & C Files, 26/143/3, 5th June, 1924.
high and as a result few new mills opened. Those that wished to enter the industry could do so easily, by purchasing an existing mill. Many mills closed because no one was prepared to take on mills that were unprofitable. In two cases farmers had taken over the running of mills, as co-operatives, when the previous owners had wanted to sell out. These mills at Cust and Waimate did not last as co-operatives for many years. In 1926, a new mill was built at Waikari by farmers, and run as a co-operative.\(^{32}\) By the early 1930's it was in financial difficulties despite having advantages of a railway siding, no close competition and closeness to wheat areas. The mill was transferred into private hands in 1933 and is still in operation today.

Distributors Ltd created stability in the industry and this was what induced several new mills to open in the years 1932-3, despite depression in the country. These mills are listed below:

- Aulsebrook & Co. Christchurch
- Simplex Milling Co. Southbrook
- Proteena Milling Co. Christchurch
- Central Milling Co. Christchurch
- Sefton Milling Co. Sefton
- Star Milling Co. Dunedin\(^{33}\)

This shows that in general Christchurch and North Canterbury were favoured as the most suitable sites for mills. They were close to a city, a port, and a wheat-growing area. The mill of Aulsebrook and Co. was built for supplying flour to

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32 Personal communication with present owner.
the adjacent biscuit factory. There was no railway siding
to the mill and wheat had to be carted from Addington
railway station by truck. These new mills had "aggravated
friction"\textsuperscript{34} between mills and a flour war resulted. The
associated mills reduced the price of flour by £1 per ton
in an effort to regain trade from the free mills,\textsuperscript{35} most of
which are listed above.

Parallels were drawn at the time comparing New
Zealand's milling situation with that of England after the
First World War. Then there were too many mills for the
amount of flour required in England. As a result the large
mills declared 'war'. At the end of seven years of prices
at which nobody could make money the larger mills were able
to absorb the smaller mills.\textsuperscript{36} This situation appeared to
be developing in New Zealand, especially in the South Island.
A miller at the time said however -

"there was little fear of the war in New Zealand
continuing for seven years, but on the other hand
there was at present no sign of the war ending." \textsuperscript{37}

The war could have continued for seven years, however, the
Government introduced new regulations in the following year
(1936) which stabilised the industry.

SUMMARY

The combination of mills into selling organisations
twice within the period distorted the pattern of mill

\textsuperscript{34} Press. Sept. 18th, 1934.
\textsuperscript{35} Ibid.
\textsuperscript{36} Press. Feb. 10th, 1935.
\textsuperscript{37} Ibid., Feb. 10th, 1935.
distribution as many mills could remain in operation longer than they would have under free competition. Country mills were usually small and often had low running costs. While they produced for their local hinterland they were viable units. When they tried to expand sales beyond their local area they ran into competition from the large mills and often could not compete with the highly organised selling techniques of these mills. Transport problems further hampered sales of flour outside the small country mills' local area. When local wheat production fell as a result of good prices prevailing for alternative products, particularly lamb and wool, difficulties in railling in wheat supplies from other areas or ports, were experienced. Faced with a declining market many closed down.

Mills in the South Island had originally been located near wheat supplies and markets. As communications developed, so the intake area of wheat for mills expanded. The introduction of the roller mill had meant that mill sizes, and consequently production, could be greatly increased. The larger mills were located where they could obtain wheat from a wide area while having access to a large market or a port for shipping flour to the markets of the North Island. These mills had advantages over country mills when imported wheat had to be used because local supplies were insufficient.

The trend towards concentration of milling capacity into the port towns of the east coast of the South Island had largely taken place by 1925. Indeed, the largest fall had occurred by 1913 as uneconomic mills ceased operations in many country areas. Despite the many closures the
capacity of the country's flour mills was still in excess of requirements. After two attempts by millers to reduce output, which had been unsuccessful, the Government stepped in with a compulsory scheme for limiting mills' output of flour.
CHAPTER VI

THE MODERN PERIOD 1936-72

INTRODUCTION

The modern phase of flour-milling began in 1936. In that year the Government introduced legislation that limited the production of flour by each mill, in order to stop overproduction. In addition, controls were placed on the cost of wheat to millers and the price that could be charged for flour, bran and pollard. Despite these controls, changes have occurred both in the internal structure of the industry, and in the distribution of mills, in the period since 1936. The Government, through legislation, made compulsory what millers' organisations had been trying to achieve voluntarily on two past occasions.

THE QUOTA SYSTEM

It is necessary to understand the functioning of government controls to ascertain their importance in distorting the location pattern of mills. Many other countries including Australia and Britain have little government control over the industry. It is therefore also of value to ask why controls were necessary in New Zealand? This question will be answered later in the chapter.

Each mill existing in 1936, with the potential to
operate, was allocated a production figure for flour based on its sales in the previous three years. In this way the country's requirements for flour were divided among all mills. Imports of flour were prohibited to protect the local trade and increase sales. The price of wheat, delivered to the nearest railway station, was fixed for the wheat grower. The miller therefore had -

"an assured supply, an assured share of the market, and a guaranteed price for his product." ¹

Milling had become only a 'processing' operation with no worry of wheat supply, finding markets or transport costs. Profits were to be obtained by the efficiency of the processing.

The Wheat Committee, later to be known as the 'Wheat Board', had been established by the Government to conduct all the transactions of buying and distributing wheat as well as distributing flour. Distributors Ltd ceased operations when the Wheat Committee was formed, and many of the staff were taken over by the Committee. The latter body was also responsible for exporting any surplus wheat from the New Zealand crop, and for importing to meet deficiencies.

There was a provision in the regulations that unless a mill "was erected and operating as a flour-mill before the 1st day of February, 1936" ² it would not obtain a monthly quota. This has been the major sphere in which regulations have controlled mill locations. Mills could only be built if a quota was obtained from a mill that closed down. The

² New Zealand Gazette, 2nd April, 1936.
only way production of existing mills could be increased was by buying out other mills, closing them down and transferring quota. This has been a major factor in changing patterns of milling, some mills have increased production by closing down other mills. Approval of the Wheat Board, which has regard for the public interest, has been necessary before transfers of quota could occur. By keeping a control on the transfer of quotas, the Wheat Board has been able to secure the growth of milling capacity in the North Island where the major markets are located.

ACCEPTANCE OF THE QUOTA SYSTEM

Objections to the new scheme in 1936 came from millers who had previously not belonged to Distributors Ltd. They found their production was limited to the level that similar sized mills operating under Distributors Ltd were on. Some smaller mills were not pleased with the quota allotted them, especially when under Distributors Ltd they had been allowed to purchase output from other mills. Reid and Sons, who owned mills at Luggate and Arrowtown, complained in a letter -

"The Quota allotted us by the Wheat Committee is our proportionate sales over the last three years under Distributors but not including the purchase of output and we consider that we are at least entitled to the full sales, as it is apparent that the mills selling output have been allowed their full quotas though they must have been larger than their actual sales."³

³ I & C File, 26/143/11, July 18th, 1936. Letter to Mr W.A. Bodkin, M.P.
They hoped that increased quota would enable them to supply most of the local demand and local wheat would be used rather than railed to city mills.\textsuperscript{4}

Reid's application for increased quota was refused by the Wheat Committee, but he was assured he would share in any increase in quota after the removal of imported Canadian flour. Other mills no doubt wrote to the Wheat Committee asking for increased quotas, however no increases were granted.

A complaint that appears justified is that there was no incentive to produce top quality flour. Bakers have opposed the scheme for many years on this basis. Flour produced by mills must pass inspection but there is no need to reduce efficiency to improve quality. Bakers are generally supplied from the closest flour-mill. Mills that claimed to sell large amounts of flour through its consistent quality, felt they had lost under the Government scheme, and that the years of building up customers was wasted.

Millers at the time generally appeared to be in favour of the scheme. Mr R.K. Ireland, a miller who was also chairman of Distributors Ltd, is quoted as saying -

"though millers' profits would be limited to a narrow margin, he was sure the scheme would work."\textsuperscript{5}

Another miller, Mr Robert Milligan of Ngapara, said the new wheat and flour stabilisation scheme was -

\textsuperscript{4} It is interesting to note that the output purchased was 63 tons in 1935, from G. Trapnell and Sons Ltd at Brookside. Rather than compete with Christchurch and the Southbridge mill Trapnell must have preferred to sell part of his output quota.  

\textsuperscript{5} \textit{Press}, Feb. 11th, 1936.
"thoroughly sound and workable, and that the flour-milling industry would be benefitted by its introduction." 6

EFFECTS OF THE QUOTA SYSTEM ON MILL LOCATIONS

In 1963 a Committee of Enquiry into wheat growing, flour-milling and bread baking industries said in its report -

"The smaller...... mills probably survive only because of the protected nature of their trading operations." 7

The geographical distribution of mills, protected by government controls, has frequently been questioned as at times the distribution has been uneconomic. This was particularly the case when Australian wheat had to be imported to supply country mills in the South Island, and the flour produced then shipped to the North Island. The Government, through subsidies on flour, was supporting mills that were disadvantageously situated in respect to market and wheat supplies. This situation has been altered in recent years through the availability of ample wheat in the South Island to supply all mills.

The Wheat Board will not release figures on the cost of sending flour, bran and pollard to the North Island market, as against milling wheat closer to these markets. It is believed that it is uneconomic to send flour from the South Island to the upper half of the North Island, however this does occur on a small scale. The lower half of the North

6 Press, Feb. 15th, 1936.
7 Committee of Enquiry, p.37.
Island can be supplied from the South Island as cheaply as mills in the area could supply flour.

Quotas have tended to maintain mills that would, in economic terms, have been better amalgamated. In the South Island there are several cases of two mills operating close to one another for only one shift a day. With no increase in milling machinery it would be possible to work two shifts or more a day and so utilise the machinery more efficiently. The duplication of expense incurred by running two mills would be avoided. There has been, however, no market for second-hand milling machinery and so such a move has taken place only when mills have been bought out. The Timaru mills were, over a period of time, all taken over by one of their number this increased production, and later they built a new mill at Wellington. The Committee of Enquiry saw amalgamations as desirable in some areas, and noted -

"The present rigid control of quotas and prices tends to operate against (amalgations) and in our view is a restriction not in the interests of the national economy." 

Inefficiencies created by underuse of machinery is one way in which the price of flour is higher than is necessary. If duplication was removed the price of bread would probably not fall but it could be prevented from rising.

This section has dealt with the distortion of the pattern that has occurred through government control. It is now necessary to resume the study of the factors of wheat supply areas, transport, mill technology, and market areas,

8 Committee of Enquiry, p.38
to see their importance in altering the pattern in the period 1936-72.

PROBLEMS OF WHEAT SUPPLY

Shortages of local wheat for mills had been experienced in the early Twentieth Century as well as in the 1920's. The situation was to worsen in the 1950's as a result of increasing demand for flour and low acreages of wheat grown. The worst year in the period for imports was 1956, when over ten million bushels of wheat were imported to supplement the New Zealand production of only three million bushels.\(^9\) Wheat acreages in the Canterbury-North Otago area fell from 227,777 acres in the 1942-3 season to 89,195 acres in the 1952-3 season.\(^10\) Wheat lost popularity with farmers because of the profitability of other products, particularly wool and mutton. In 1956 over 60% of the country's flour production was in the South Island and much wheat had to be imported to supply these mills.

Mills did not have to worry about the cost of the transport of imported wheat to their sites, however, if they were not on a rail siding they had to pay the cost of transport from the nearest station. This posed problems for many South Island mills as Australian wheat was often transported in bulk and the mills had previously been receiving local wheat in sacks. Facilities for handling the bulk wheat had to be rapidly constructed.

By the late 1960's declining prices for alternative

\(^9\) Committee of Enquiry, p.7.
farm products had encouraged wheat growing. There was sufficient for the South Island mills' needs and by 1971 New Zealand, as a whole, was self-sufficient in wheat. South Island wheat for milling was shipped to the North Island in large quantities. North Island mills are all situated close to ports (with one exception at Palmerston North), and can therefore use either Australian, or South Island, wheat. In general the New Zealand wheat grower has been paid more than the ruling world price for wheat in an effort to conserve overseas funds. In 1973 a world wheat shortage escalated the price of wheat so that the Wheat Board had to pay almost double the price per bushel paid for local wheat. New Zealand was lucky that the deficit between local supply and demand was only about 35,000 tons.\(^{11}\)

The effect of fluctuating New Zealand wheat acreages has been to reinforce the belief by many that more wheat should be milled in the North Island, close to markets. In this way there is no loss of economy when imported wheat has to be used. The shortage of local wheat, together with the need for an almost complete renewal of plant, led the firm of Ireland and Company of Oamaru to consider sites in the North Island for a new mill. Wellington was considered, but the expense of a site proved too great, and eventually a new mill was built at Mount Maunganui, the port of Tauranga. This mill opened in 1959, the same year as an Auckland firm, the Northern Roller Milling Company, also built a mill at the port. The quota for this mill was largely obtained from the purchase of Fleming and Company's mill in Christchurch.

which was closed in 1958.

In this way private enterprise has assisted the Government by locating flour-mills where a need existed. The new mills were more efficient than the previous mills at Oamaru and Christchurch, and so the owners profited and the Wheat Board's transport costs were reduced. By approving the transfer of quota only to areas where there will be reductions in transport costs, the Government has managed to control private enterprise in a way that is most beneficial to the public interest. The newest mill to be built in New Zealand was in Wellington in 1971. Quota was obtained by the closure of a Timaru mill and the mill was located for the supply of the large Wellington market which previously had to be supplied from South Island mills.

CHANGING MARKET DEMANDS

In 1936 the population of the North Island was 1,018,036 (64.69%) while the South Island had 555,774 (35.31%).\textsuperscript{12} From that date to the present time, the proportion of the country's population living in the North Island has increased. By 1972 almost 75% of the country's population was in the North Island.\textsuperscript{13} Flour demand is closely tied with population. This is shown by Wheat Board figures. The North Island local production of flour added to the quantity shipped from the South Island gives a total of approximately 168,000 tons. New Zealand total flour


\textsuperscript{13} N.Z. Year Book. 1972. North Island population 2,051,363 (72%), South Island 811,268 (28%).
production is about 240,000 tons, which means about 75% of the demand is in the North Island.\textsuperscript{14}

Unlike many other products the consumption of flour varies little from year to year, except through increases in population. Consumption is based on the family unit, through the use of flour for bread and biscuits and for home baking. Other users include the starch industry, however, as there is only one company, in Auckland, details of flour used are unavailable. Smaller quantities are used in the manufacture of pastes, vermicelli, macaroni, and by butchers for sausages. New Zealand cannot export flour competitively with other countries, particularly Australia, as the cost of the flour produced is too high and frequently supplies of wheat have not been adequate. With population, and therefore consumption, concentrated in the cities of the North Island, this is where the major market lies.

Bran and pollard demand is dependent upon "seasonal conditions and supplies of other grains and feeds."\textsuperscript{15} Production of the two by-products is fixed by the production of flour in the country, demand varies. The areas of demand are spread over the country and are found wherever livestock and poultry are concentrated. The large demand of the North Island has meant that some 10,000 tons of bran and pollard has to be shipped there from the South Island.\textsuperscript{16} This is done at high cost as bran and pollard cannot support long distance travel. For this reason "the most economic point

\footnotesize{14 Personal correspondence with N.Z. Wheat Board.}  
\footnotesize{15 Committee of Enquiry. 1963. p.43.}  
\footnotesize{16 Personal correspondence with N.Z. Wheat Board.}
(for milling) is that which is nearest the consumer of bran and pollard.\textsuperscript{17} In 1969, however, a large proportion of South Island bran and pollard was sent to Auckland, with New Plymouth as the next largest consumer.

CHANGING TRANSPORT AND MILL TECHNOLOGY

Before the mid 1960's, wheat was transported to South Island mills almost wholly by rail. Mills not on rail sidings had to truck from the nearest railway station to the mill, with most of the locally grown wheat being transported in sacks of 180 lbs (3 bushels). The extra expense of carting wheat from a station does not appear to have caused many mills to close, as at least six of the surviving mills were not on a rail siding.

Following trends overseas, farmers took an increasing interest in bulk handling of wheat as a way to cut costs. The number of bulk headers rose from 22 in 1960 to 131 by 1961.\textsuperscript{18} It was then evident that their use would become widespread in the following years. Following this change in handling techniques, flour-mills responded with the building of bulk silos for storing bulk wheat. Zealandia Milling Company in Christchurch built silos in 1963.\textsuperscript{19}

A change of transport resulted from the change in handling techniques. Trucks now carried wheat in bulk that was tipped into the elevator bins at the mills for filling the silos. Mills not on rail sidings were no longer placed

\textsuperscript{17} Report on the Economics of Shipping Wheat to Auckland compared with Flour, Bran & Pollard. p.2.

\textsuperscript{18} Committee of Enquiry. 1963. p.27.

at a disadvantage, but road access, which all had, was now
important. The distance that wheat could be transported by
road was limited by government regulation, however to
maximise the benefit of bulk cartage by road the limit was
raised to 60 miles.

Mills were keen to change to bulk wheat supply as it
reduced the need for seasonal labour for stacking the sacks
of wheat, while little wheat was wasted through vermin. New
machinery had to be installed for the transfer of wheat from
the silos to the mill and capital was required for this
construction, and the building of silos. It was a case of
machinery doing what previously labour had been required to
do.

The trend from sacked to bulk wheat had a sequel when
similar economies were applied in the transport of flour.
As early as 1963, when the Committee of Enquiry met, there
was reference to the development overseas of flour handling
in bulk,\textsuperscript{20} and it was suggested that it would be a develop-
ment of the future. Bakeries, the chief users of flour,
were keen to see the system introduced as it cut down labour
costs at the bakery.

After 1970 the number of mills producing bulk flour
grew spectacularly. Mills could store flour in a silo at
the mill, transfer to a bulk road or rail tanker which then
delivered the flour to a bakery, where it was blown into the
bakery's silo. No human handling or sacks were needed. The
method was used in A. & B. Consolidated's biscuit factory
in Christchurch in 1971 for the transfer of flour by a pipe

\textsuperscript{20} Committee of Enquiry, 1963. p.32.
from the mill to a silo in the bakehouse. In Christchurch the major bakery in 1973 had still not converted to bulk flour, but the change was imminent. The New Zealand Wheat Board estimated that by late 1973 about 60% of the flour trade was in bulk.  

The demand by bakeries in the North Island and in areas of the South Island where there were no local mills, brought problems for supplying bulk flour. This has been largely overcome by the use of bulk railway tankers (Plate 20). These tanks can be removed from the railway wagons for transfer to the bakeries. Bulk railway tankers have meant that the rail ferry across Cook Strait has been used increasingly for the transfer of flour between islands. At the present time about 20 railway tankers are in use for the transport of South Island flour to the North Island. Most are loaded in the Timaru–Oamaru area. Nelson bakeries are supplied with bulk flour from North Canterbury mills.  

This method is deemed by the Wheat Board to be economic for supplying the southern half of the North Island, but not economic for Auckland supply, where there is a shortage of bulk flour at present.

Mills producing bulk flour in 1973 also produced sack floor because small bakeries and pastrycooks still require flour in sacks. As a result no great economies of labour can be achieved except where the mill runs two shifts and packs flour into sacks on only one of them. This is the

21 Personal communication with the General Manager, N.Z. Wheat Board, 10th September 1973.

22 Personal communication with New Zealand Railways, 6th August, 1973.
case in several mills. In the South Island 11 of the 18 mills produce bulk flour with one installing bulk facilities at present. This is discussed more fully in Chapter VII. The flour-milling industry has had to work in harmony with farmers, and with bakers, to effect the two changes in handling methods. The resultant demand for road transport and new railway equipment has been responded to by cartage contractors and New Zealand Railways.

THE CHANGING PATTERN OF SOUTH ISLAND MILLS

In this chapter the factors of government control, wheat supply, market demands, transport and mill technology have all been discussed as far as they affect the economies of milling. Within government control of the industry, through the Wheat Board, private enterprise has been left to effect economies of production within mills. As a result the changing pattern between 1936 and 1972, which is shown in Figure 6, has been a result of the actions by private enterprise, approved by the Wheat Board.

The building of three new mills in the North Island has already been discussed in respect to changing market areas, the economies of transport, and wheat supply. Contrasting with this has been the reduction in the number of South Island mills from 41 to 18. The explanation for the closure of many mills cannot be ascertained. It was believed, when the quota and price control regulations were

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23 Three mills closed in 1936 before the 10th August when a list of mills was available.
DISTRIBUTION OF FLOUR-MILLS
1936-72

\[\text{FIG. 6.}\]
introduced, that mills which had high running costs per ton of flour produced, would be forced to close through lack of profitability. There is no evidence to suggest that this has not been the case. Mills that have been profitable in the eyes of the owners have survived. This has involved re-equipment of many mills and a 'sufficient' quota has been necessary to reduce fixed costs.

A list of mills operating at the 10th August, 1936, was obtained from Department of Industries and Commerce records. The list included the sack capacity of each mill which indicates the number of sacks of flour per hour the mill was capable of producing. There is no exact correlation between the sack capacity and the quota allocated by the Wheat Committee, but the two were roughly similar. Table 5 shows mill locations, sack capacity, and the time period of closure.

DATES OF CLOSURE

Closures were most numerous in the first years of government control, but have been spread evenly throughout the 36 years. Table 6 shows this clearly. All of the mills that closed between 1936 and 1942 were small, having capacities under five sacks per hour. In each year until 1941 there was at least one closure. Mills attempted to profit within the Government scheme, but many of the small enterprises failed. In 1958-1959 four mills closed, the largest number in any two year period. Prior to 1955 mill owners who decided to cease business usually sold the quota to the nearest mill, or sold a portion to several local mills. Since that date there has been an increasing trend towards outright takeovers
Table 5: Size of Flour-mills, 1936

<table>
<thead>
<tr>
<th>Flour-mill Name</th>
<th>Location</th>
<th>Capacity sks/hr</th>
<th>Time Period of Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Brothers Ltd.</td>
<td>Christchurch</td>
<td>33</td>
<td>d</td>
</tr>
<tr>
<td>Timaru Milling Co. Ltd.</td>
<td>Timaru</td>
<td>25</td>
<td>x</td>
</tr>
<tr>
<td>D.H. Brown and Son Ltd.</td>
<td>Christchurch</td>
<td>25</td>
<td>x</td>
</tr>
<tr>
<td>Crown Milling Co. Ltd.</td>
<td>Dunedin</td>
<td>17</td>
<td>x</td>
</tr>
<tr>
<td>Evans and Co. Ltd.</td>
<td>Timaru</td>
<td>15</td>
<td>d</td>
</tr>
<tr>
<td>Ireland and Co. Ltd.</td>
<td>Oamaru</td>
<td>12</td>
<td>c.NI</td>
</tr>
<tr>
<td>Harraway and Sons Ltd.</td>
<td>Green Island</td>
<td>12</td>
<td>x</td>
</tr>
<tr>
<td>Cadbury, Fry Hudson Ltd.</td>
<td>Dunedin</td>
<td>12</td>
<td>c</td>
</tr>
<tr>
<td>Belford Mills Ltd.</td>
<td>Timaru</td>
<td>12</td>
<td>b</td>
</tr>
<tr>
<td>J.R. Bruce Ltd.</td>
<td>Timaru</td>
<td>12</td>
<td>d</td>
</tr>
<tr>
<td>J. and T. Meek Ltd.</td>
<td>Oamaru</td>
<td>11</td>
<td>x</td>
</tr>
<tr>
<td>Fleming and Co. Ltd.</td>
<td>Christchurch</td>
<td>10</td>
<td>c</td>
</tr>
<tr>
<td>Canterbury Roller Flour Mills Ltd.</td>
<td>Ashburton</td>
<td>10</td>
<td>x</td>
</tr>
<tr>
<td>Milligans Eclipse Flour Mills Ltd.</td>
<td>Ngapara</td>
<td>9</td>
<td>x</td>
</tr>
<tr>
<td>Zealandia Milling Co. Ltd.</td>
<td>Christchurch</td>
<td>9</td>
<td>x</td>
</tr>
<tr>
<td>Model Flour-milling Co.</td>
<td>Rangiora</td>
<td>7</td>
<td>x</td>
</tr>
<tr>
<td>Fleming and Co.</td>
<td>Invercargill</td>
<td>7</td>
<td>x</td>
</tr>
<tr>
<td>H. Archer and Sons</td>
<td>Southbrook</td>
<td>6</td>
<td>x</td>
</tr>
<tr>
<td>Buchanans Flour Mills Ltd.</td>
<td>Ashburton</td>
<td>6</td>
<td>d</td>
</tr>
<tr>
<td>Clarks Milling Co. Ltd.</td>
<td>Maheno</td>
<td>6</td>
<td>x</td>
</tr>
<tr>
<td>Richard Evans Ltd.</td>
<td>Kaiapoi (Ohoka)</td>
<td>6</td>
<td>x</td>
</tr>
<tr>
<td>Softon Flour Milling Co.</td>
<td>Sefton</td>
<td>5½</td>
<td>b.Chch.x</td>
</tr>
<tr>
<td>Wilkie and Co.</td>
<td>Mosgiel</td>
<td>5</td>
<td>c</td>
</tr>
</tbody>
</table>
Table 5: Size of Flour-mills, 1936 (Cont.)

<table>
<thead>
<tr>
<th>Flour-mill Name</th>
<th>Location</th>
<th>Capacity</th>
<th>Time Period of Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waikari Milling Co. (1932) Ltd.</td>
<td>Waikari</td>
<td>5</td>
<td>x</td>
</tr>
<tr>
<td>Temuka Milling Co. Ltd.</td>
<td>Temuka</td>
<td>5</td>
<td>x</td>
</tr>
<tr>
<td>Star Milling Co.</td>
<td>Dunedin</td>
<td>5</td>
<td>b</td>
</tr>
<tr>
<td>Reid and Sons</td>
<td>Luggate and Arrowtown</td>
<td>5</td>
<td>a, a</td>
</tr>
<tr>
<td>Harrisons (Winchester) Ltd.</td>
<td>Winchester</td>
<td>5</td>
<td>x</td>
</tr>
<tr>
<td>Glenpark Mills</td>
<td>Dunedin</td>
<td>5</td>
<td>a</td>
</tr>
<tr>
<td>Aulsebrook and Co.</td>
<td>Christchurch</td>
<td>5</td>
<td>x</td>
</tr>
<tr>
<td>Hall and Co.</td>
<td>Dunedin</td>
<td>4</td>
<td>?</td>
</tr>
<tr>
<td>Phoenix Mill</td>
<td>Waianakarua</td>
<td>4</td>
<td>a</td>
</tr>
<tr>
<td>McCallum and Co.</td>
<td>Blenheim</td>
<td>4</td>
<td>c</td>
</tr>
<tr>
<td>Redwood Bros. Ltd.</td>
<td>Blenheim</td>
<td>3</td>
<td>d</td>
</tr>
<tr>
<td>J. Simpson</td>
<td>Southbridge</td>
<td>2</td>
<td>a</td>
</tr>
<tr>
<td>G. Trapnell</td>
<td>Brookside</td>
<td>2</td>
<td>b</td>
</tr>
<tr>
<td>Richmond Mills</td>
<td>Richmond</td>
<td>1</td>
<td>a</td>
</tr>
</tbody>
</table>

Key

- Closed between 1936 and 1942 ..... a
- Closed between 1943 and 1952 ..... b
- Closed between 1953 and 1962 ..... c
- Closed between 1963 and 1972 ..... d
- Still open in 1973 ............... x

"NI" and "Chch" signify respectively a change of mill site to the North Island and Christchurch.

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24 Compiled from I & C Files 26/143/13, 10th August, 1936 and Wheat Board information supplied 2nd April, 1973.
Table 6: Dates of mill closures

<table>
<thead>
<tr>
<th>Date</th>
<th>Number of mills closing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1936-1942</td>
<td>6</td>
</tr>
<tr>
<td>1943-1952</td>
<td>4</td>
</tr>
<tr>
<td>1953-1962</td>
<td>5</td>
</tr>
<tr>
<td>1953-1972</td>
<td>5</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
</tbody>
</table>

of operating companies, with a subsequent closing down of mills and transfer of quotas. The Wheat Board bought quota from mills closing, after such an action was recommended by a Caucus Committee in 1953.\(^{25}\) This quota is allocated to mills that require extra flour production to meet local demands, thus saving transport costs.

SIZE OF MILLS CLOSING

Table 5 reveals that in 1936 most of the milling capacity of the South Island was concentrated in the towns and cities of the East Coast, namely Christchurch, Ashburton, Timaru, Oamaru and Dunedin. All mills with capacities above nine sacks per hour were in these urban areas. The country mills, 17 in number, had smaller capacities and many were among the first mills to close through unprofitability. The table also reveals that while there was a greater chance of small mills closing, several of the larger mills, including Wood Brothers Ltd, the largest mill in 1936, also closed.

\(^{25}\) Committee of Enquiry. p.37.
AREAS OF CLOSURE

The closure of mills in Nelson and Marlborough provinces presents an interesting study in mill location. All three mills were small and this appears to be an important feature in the reasons for closure. Declining wheat acreages in Waimea County may have had a bearing on the decision to close the Richmond mill. In 1951 Marlborough mills produced only 1612 tons of flour between them. Redwood's mill was assisted by the addition of some of the Wheat Board quota so that all the local milling wheat offered could be used within the area. A fire in 1970 destroyed their mill and it was decided not to rebuild. Wheat from the area is now sent to Wellington and flour for both Marlborough and Nelson has to be supplied from Canterbury. Establishing a new mill, with a very small quota, was financially impossible. The loss of the three mills in Nelson-Marlborough is one of the most noticeable trends in the areas of mill closure.

Ten mills in the cities of Christchurch, Timaru and Dunedin closed down. These closures included both large and small capacity mills. In Timaru and Dunedin, mills within the city purchased the quota of the other mills. Production has been left concentrated into two mills in Dunedin and one in Timaru. Christchurch lost the quota of two mills to a North Island mill, but gained a mill after fire destroyed the mill at Sefton. Country mills that were still in operation in 1950 have remained open to the present day.

26 I & C Files, 26/143/3, 19th Feb., 1951.
27 Blenheim and Ashburton mills, located in large towns, are not counted.
FINANCIAL REASONS FOR MILL CLOSURES

Mills were not forced to close because of competition. Reasons were, however, often connected with the capital investment needed to improve plant and replace worn out equipment. Many of the recent takeovers may have been influenced by the existence of subsidiary operations run by the mills. Oatmeal processing and stockfeed plants, as well as poultry raising, have been associated with some mills that have recently been bought out. It cannot be presumed that all mills that have closed were inefficient or unprofitable. The opportunity of immediate cash gains rather than a small yearly profit must have appealed to many mill owners.

At present there is a contrast in the ownership of mills. Many have become highly organised commercial enterprises, run by a man trained in management skills, intent on lowering costs and raising profit per ton of flour produced. On the other hand, many mills have continued as family businesses. Often such mills are still being run by descendants of the original founders, and family pride has had a bearing on the pattern of closures. The closure of the small mills at Luggate and Arrowtown, owned by William Reid, were primarily a result of the death of William Reid senior in 1941. Other members of the family were reluctant to continue a business with a low profit and little future. Sometimes shares were apportioned to the members of the family on the death of the founder. Further multiplicity occurred on the death of these shareholders. Consequently, when many of the shareholders had no direct interest in the
operation of the mill, takeover bids were successful.

High profits are not to be made from milling. Because of the stability of sales and no fear of competition the Government deliberately maintains profits at a moderate level because shareholders have little risk on their money. The mills operating at present have few worries and only in the event of the removal of government control would there be any major upheavals in the industry.

THE DECLINE OF THE SOUTH ISLAND MILLING INDUSTRY

It has been shown that since 1936 the number of mills in the South Island has fallen by about 20. While production of flour fell only 9% in the 27 years to 1963, there was a rapid drop of 12% in the next nine years. This was a result of increased production in the North Island. The transfer of quota between islands is clearly shown in Table 7.

Table 7: Percentage Distribution of Quota between Islands 1936-72

<table>
<thead>
<tr>
<th></th>
<th>1936</th>
<th>1963</th>
<th>1972</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Island</td>
<td>31%</td>
<td>40%</td>
<td>52%</td>
</tr>
<tr>
<td>South Island</td>
<td>69%</td>
<td>60%</td>
<td>48%</td>
</tr>
</tbody>
</table>

The increase of the North Island's production of flour has been a result of takeovers of South Island mills and the

28 Committee of Enquiry, p.38 and personal communication with N.Z. Wheat Board.
transfer of their quota to North Island mills, together with the transfer of operations to the North Island by two South Island mills. Production of individual South Island mills has not dropped since 1936, indeed it has increased through natural increase of quota with population growth. South Island flour production has fallen, comparative to that of the North Island, and now the South Island produces less than half of the New Zealand total production of flour.

The building of mills relying on shipped wheat closer to markets has meant that the New Zealand industry can be described as market-oriented. The South Island mills often still exist close to the raw material and produce in excess of local markets. While South Island mills are market-oriented in total production, they are still raw material oriented in the number of mills.

The industry is in a transition stage at present, poised between an orientation to raw materials and an orientation to markets. In the future, as buildings and machinery have to be replaced in many of the South Island mills, there will no doubt be more transfers of quota to the North Island. This will take a long time while the present regulations protect mills from transport costs and competition.

SUMMARY

The period 1936-1972 has been one of great change within the South Island milling industry. Technological innovations have transformed the internal structure of mills and have posed problems for many of them. Population
growth in the North Island has brought increased demand for flour in areas remote from the South Island mills. The quota system, while guaranteeing trade for all mills, has been the framework within which private enterprise has worked. Greater mill efficiency has been obtained by the purchase of several South Island mills and transferring their quotas to North Island mills. Similarly some South Island mills have bought out nearby mills so that production has been concentrated into one mill. Private enterprise has assisted the Wheat Board in meeting the changes of demand and reducing transport costs.

Demand for bulk flour, and the ease of transporting bulk wheat by ship, have encouraged the growth of milling close to markets. South Island mills have tried to co-operate by installing bulk flour facilities for the supply of bulk rail tankers. This system will remain efficient only as long as wheat supplies are available locally. If there is a return to the situation as it existed in the mid-1950's, then the country mills would have to be heavily subsidised again. The port mills of the North Island are insulated against changes of wheat supply areas. They can take either Australian or South Island wheat. This is no doubt a factor in their encouragement by the Wheat Board.
CHAPTER VII

THE SOUTH ISLAND MILLING INDUSTRY, 1973

INTRODUCTION

The historical survey of the changing pattern of flour-milling in the South Island was brought up to date by a survey of the existing mills. A questionnaire (Appendix I) was used to gain information from millers on the present day situation. Of the 18 mills in the South Island today, 13 responded to the questionnaire. Additional information was supplied by the New Zealand Wheat Board. Despite government control of the industry large variations occur between mills; especially relating to mill technology, markets, and the difference between the country and city mills. These contrasts will be brought out in this chapter.

PRESENT MILL LOCATIONS

Present mill locations largely reflect the residue that has been left after uneconomic mills have closed down in the period since 1900. The majority of country mills, and several city mills, were operating before 1900 and have survived to the present day. The factors that have caused their survival are diverse and frequently inexplicable in economic terms. Stubbornness in the face of unprofitability in earlier periods and resistance to takeover bids in recent
times, are just two of the factors. All mills were originally sited to be close to grain supplies and are still suitably located for intake of wheat from the surrounding area. Many of the country mills are not close to markets and they generally have to rail or ship much of their flour production to other areas.

Site choice of many mills was dependent on the factors that were important several decades ago. The influence of power supply can be clearly seen in such mills as Ohoka, Winchester, Southbrook and Ngapara, where availability of water (or coal in the latter case), combined with access to wheat, were the major factors in choice of site. Mills built later reflect the desire to locate near a railway and mills at Timaru, Temuka, Rangiora, Waikari and Christchurch illustrate this. Closeness to market was the reason that several mills located in cities. It has already been shown that after the introduction of railways wheat could be transported cheaply over long distances and so mills were able to locate close to markets (and ports) and draw their wheat from a wider area.

Having seen that mills are located primarily according to criteria that were valid reasons in the past, it is logical to ask whether they are still ideally situated today. A form of industrial inertia, aided by government protection, may have encouraged mills to remain in disadvantageous locations. Today, mills are still ideally sited for the intake of wheat from surrounding areas. Up to a few years ago they were reasonably sited for access to
the markets of the North Island. In 1969\textsuperscript{1} it was shown that some parts of the South Island could send sacks of flour, bran and pollard to Auckland cheaper than the equivalent volume of bulk wheat could be sent. In the last two years, however, demand by Auckland bakeries for bulk flour has meant that South Island mills are unable to supply such flour economically.

It is impossible generally for a mill to be disadvantageously sited under the present government regulations. Transport costs of wheat to mills, and of flour from mills, do not have to be paid by them. In a few cases, mills that are not on railway sidings have to pay the cost of transporting flour to the nearest railway station. This cost was estimated at two dollars a ton by one mill. When questioned, four mill owners (or managers) admitted they would have been better located on a rail siding.

MARKETS OF SOUTH ISLAND FLOUR

Production of flour in the South Island is considerably in excess of the island's requirements. Part of the function of the Wheat Board is to disperse flour from the mills to purchasers in the cheapest way possible. Mills are distributed in the South Island in such a way that there are only two main areas of population that have no mills nearby. These are Nelson-Blenheim and the West Coast towns. The supply to these areas was found to be largely from the

\textsuperscript{1} N.Z. Flourmillers Association (Inc.), Report on the Economics of Shipping Wheat to Auckland compared with Flour, Bran and Pollard. 1969. p.3.
Christchurch-North Canterbury area. Other towns and cities have mills located close by. In some areas the mills have their total production consumed in their vicinity. Invercargill is the best example of this, although Christchurch mills have little spare flour that has to be transported elsewhere. Mills that are not in these two cities have to send flour to other areas, particularly the North Island.

Excess production above local needs is greatest in North Otago, where three mills have only one major town, Oamaru, to supply. From the area between Christchurch and Dunedin the majority of the flour shipped to the North Island originates. This movement accounts for about 50,000 short tons of the South Island's total production of just over 100,000 tons.

Areas to which flour is sent are mainly the cities that do not have mills, particularly Napier, Hastings, Gisborne and Wanganui. The mill at Wellington, opened in 1971, does not produce sufficient flour for demand in the city and so flour is still sent there from the South Island. Similarly Auckland mills produce insufficient flour for the needs of Auckland and Northland, and the balance has to be sent from the South Island. It is interesting to note that the areas that are currently supplied from the south are similar to those to which flour was sent from the Wakanui mill in 1902.
CITY AND COUNTRY MILLS

INTRODUCTION

There is a considerable contrast between mills in the study area that are located in cities and those in smaller towns. As a result it is convenient to discuss such factors as mill technology, size and markets, in relation to the location of the mills. It can be seen from Figure 6 that eight mills are sited in cities and the other ten are in towns. Many of the latter mills are positioned outside the town boundaries.

SIZE OF MILLS

In 1972 only three mills had basic quotas above the smallest of the North Island's six mills. The breakdown of South Island quota figures is shown in Table 8.

Table 8: Size of South Island Mills

<table>
<thead>
<tr>
<th>Size Range</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 10,000 tons</td>
<td>2</td>
</tr>
<tr>
<td>5001-10,000 tons</td>
<td>5</td>
</tr>
<tr>
<td>3001-5,000 tons</td>
<td>7</td>
</tr>
<tr>
<td>Under 3,000 tons</td>
<td>4</td>
</tr>
</tbody>
</table>

The average mill quota in the South Island is 6,000 tons, compared with 17,000 tons average in the North. Of the

---

2 Heatherlies in Auckland, with a production of under 500 tons of wholemeal has been excluded in this number.
seven mills producing over 5,000 tons of flour a year in the South Island, six are city mills. The other two city mills are in the next bracket.

Country mills are generally small and have continued to operate through low rates, low maintenance costs and small transport costs. They have survived in areas which are most suited for wheat growing and continue to select wheat from nearby areas. Many are not far from cities but are prevented from sending flour there by market saturation. The four smallest mills are all in Canterbury and in two cases have been in operation for over a hundred years.

MILL TECHNOLOGY

All mills are now powered by electricity and all use roller plants so there is little to distinguish between mills in this aspect. Variation occurs between mills in the extent to which they have adopted the latest developments of bulk handling of wheat and flour. It must be remembered that conversion to bulk flour is dependent on there being a market for the product and similarly, availability of transport.

Of the mills surveyed by questionnaire there is a contrast between city mills that receive all their wheat in bulk and the country mills that in a few cases were still receiving some wheat in sacks. The highest proportion of sacked wheat to bulk wheat was 50:50 in one mill, while other mills recorded much less. The change to bulk wheat has been hampered by farmers who continue to use sacks for wheat rather than convert to bulk. Handling in bulk brought
a reduction in labour requirements for mills. Whereas previously up to ten men had been needed to stack grain in summer, most mills now need none. The mills still taking in some sacked wheat employ up to five extra hands. The change to bulk wheat has affected mill economies through the replacement of labour costs by capital expenditure on outside silos (see Plate 22), or on converting inside storehouses so that bulk wheat can be stored.

The other area where mill technology varies is in the bulk handling of flour. Of the 18 mills in the study area, 11 have bulk flour facilities. All city mills have this equipment and a few country mills have converted, while one is in the process of converting. The use of bulk flour in the city mills is necessary as most of the bakeries supplied by city mills have installed bulk flour handling equipment. While there is no compulsion to change to bulk flour, most of the mills fear loss of trade in the future if there is a demand for bulk flour and none for sacked flour. It is conceivable, in the future, that inability to supply bulk flour may result in loss of quota for the amount such mills cannot produce.

Bulk flour demand is increasing, especially in the North Island. Through bulk rail tankers most of the mills that have converted are able to send flour to the North Island and to Nelson and Blenheim bakeries. Mills that have changed to bulk flour have not experienced much fall in labour requirements, as there is still a demand for sacked flour from small bakeries, cakeshops and even a few large bakeries. This means that mills still have to produce
PLATE 21: D. H. Brown's mill in Christchurch still has the original building it had in 1892.

PLATE 22: This photograph of Worralls Flour-mills Ltd. in Christchurch, was taken in 1973. The tall white silo is used for storing flour before loading into bulk road tankers. The mill was built in 1947.
sacked flour along with the bulk, and labour is still required for packing the sacks. Bran and pollard is still largely handled in sacks but will inevitably be handled in bulk, similar to flour. At the present time labour is required for packing these by-products in sacks.

Technological advances in the methods of handling wheat and flour have brought about the opportunity of replacing labour with machinery. While at present this has been achieved mostly in wheat handling it is obvious that in the future labour requirements will fall even further when machinery is used to its maximum extent. Mills could produce large quantities of flour, bran and pollard with labour necessary only for checking and adjusting equipment. At present bulk flour usage is in a transition stage and it has been estimated that New Zealand's flour trade is 50 per cent in bulk.

TRANSPORT OF FLOUR

Wheat Board information revealed that in the year ended 31st January, 1972, about half the inter-island flour trade was by coastal vessel and half by rail ferry. Results obtained from questionnaires suggested that the rail ferries are now used more than coastal vessels for flour movement. One mill attributed this to the irregular sailings of coastal shipping. This trend has been accelerated by the increased use of bulk railway tankers for supplying the North Island. At the present time there is no method of shipping flour in bulk.

City mills producing bulk flour have it transported
to local bakeries by road tanker. Those on railway sidings that have an excess for disposal have constructed chutes for the easy loading of bulk rail tankers (see Plate 20). In two known cases, country mills that have converted to bulk flour have been faced with transport difficulties in getting it to rail. Bulk tanks have to be taken by road from the railway wagon to the mill, filled, and then returned to railway flat wagons. The alternative is the use of bulk road tankers which take flour from the mill to the railway where the flour is transferred pneumatically. These two methods are used, and by investing in these facilities, the two mills appear confident of their future and the future of bulk flour. Mills that have private sidings have to pay rental and maintenance costs for them and so have indirect transport costs which are probably similar to the transport costs of mills not on rail sidings.

OTHER VARIATIONS BETWEEN MILLS

INTRODUCTION

There are variations between mills that cannot be explained in terms of location in a city or country area. The major differences occur in types of flour produced and in the use of processing plants for the bran and pollard produced. The latter two by-products are used in stockfeed and so it is logical that plants manufacturing stockfeeds should locate adjacent to flour-mills to eliminate transport costs on these two ingredients. Mills that are located close
to wheat supply areas are also usually ideally situated for the intake of barley, peas, and the other raw materials of stockfeeds.

SPECIALTY FLOURS

A wide range of specialty flours are produced by some mills, although six mills produce none. Both country and city mills produce such flours. One country mill produces almost the total of its quota in wholemeal, which is used in special bread and biscuits. This product is sent almost wholly to the North Island. Special flours are taken off at different stages during the milling of wheat and there is therefore a limit to the quantity that can be produced by a mill. The maximum amount a mill produces is a quarter of its total flour output. Special types of flour that were produced include self-raising flour, 'dry' flour, pastry flour, sausage meal and semolina meal. These products are used for special types of baking and for mixing with meat in sausages.

While not exactly a 'specialty flour', one city mill specialises in producing small packs for sales to grocery shops and supermarkets. The process of filling the paper bags from bulk bins is largely mechanical, but several women are required. Closeness to a large labour supply may be a factor in the reason why such a subsidiary operation occurs in a city mill. Flour sold in small packs gives extra profitability to the mill involved.
STOCKFEED PRODUCTION

In the study area at least 10 mills have stockfeed plants run in conjunction with flour-mills. There are several plants that are not run by flour-mills and these are located at a distance from mills. They are supplied with bran and pollard from mills that do not process it themselves. The price of stockfeeds is not controlled by government (although the price of bran and pollard is) and there is considerable competition between plants. Bran and pollard is allocated to consumers by the Wheat Board. In times of shortage this is done on the basis of the quantity supplied during periods of surplus. The market fluctuates from year to year and between seasons, but the supply is always fixed by flour production, which has been relatively static in the past few years.

Stockfeed plants often share storage facilities with the adjacent flour-mill, but may be run as a separate entity. Labour may also be shared between the two plants. The production of stockfeed is a sideline that has no doubt brought added profit to many mills. It could also be a factor in the closure of mills, as the last two South Island mills that closed had stockfeed plants. One had extended further to incorporate poultry raising, as one of the stockfeeds produced was poultry mash.

EXCESS CAPACITY

South Island mills have the capacity to produce much more flour than they are permitted under the quota system. Many mills work only one shift a day while the maximum
worked is two shifts. Extra flour could be produced, if quotas were increased, simply by working extra hours, with no alterations to plant required. There is considerable variation in the size of plant between mills, as some mills take two shifts to produce the same amount of flour that other mills produce in one shift.

Since 1936 over-capacity has continued despite the closure of several mills. The milling industry is therefore still in a similar state to that in 1901, although compulsory limitations of production have replaced the earlier voluntary attempts. Mills would obviously like to produce more flour but are generally happy with the quota system removing the risk of bad debts and the problem of finding buyers.

CONTROL OF MILLS

Mills are run as either private or public companies, with the majority being in the former category. Many still exist as family businesses, especially in the country areas. Several mills in the city and country are run as public companies. A trend that has occurred since 1930 has been for one operator to own several mills. Often South Island mills are run independently of North Island mills belonging to the same owner. Table 9 shows the four major groupings of mills and their locations, in order of total production.

These four groups are responsible for about two-thirds of the flour produced in New Zealand. The other 14 mills supply the other third. From Table 9 it can be seen that only one major North Island mill (at Palmerston North) is
Table 9: **Mill groupings in 1972**

<table>
<thead>
<tr>
<th>Group</th>
<th>Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Roller Mills group</td>
<td>Auckland, Mt Maunganui, Invercargill</td>
</tr>
<tr>
<td>J.K. Ireland group</td>
<td>Mt Maunganui, Christchurch, Oamaru</td>
</tr>
<tr>
<td>A.S. Paterson group</td>
<td>Wellington, Timaru</td>
</tr>
<tr>
<td>A.B. Consolidated group</td>
<td>Auckland, Christchurch</td>
</tr>
</tbody>
</table>

not run in association with a South Island mill. The four major groups have been increasing production over recent years. It is possible that after buying out the smaller privately-owned mills and the small public companies, these large companies could control practically all the milling trade in years to come.

**PROBLEMS CREATED BY MILL CLOSURES**

In most areas where mills are located they provide a valuable service as storage units for local farmers' wheat. While farmers are encouraged (by payment) to store wheat on farms for as long as possible after the harvest, many have not got the silos for such storage. As a result the mills store the wheat for their years flour production during the harvest, with farm storage loads coming in throughout the year. When mills close, a deficiency of storage space for wheat often results. In Ashburton, where a mill closed in 1971, the storage facilities are still being used for the transfer of wheat to Wellington.

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Mills are therefore valuable for the service they provide in a wheat-growing area. Country mills usually have plenty of land available adjacent to the mill site for expansion, if it is necessary. It is, however, unlikely that any expansion will occur in these areas. City mills on the other hand are often cramped, with no room for expansion.

SUMMARY

Present mill locations in the South Island largely reflect the historical development of the industry. The differences between country and city mills in size is largely a result of their differing histories. Recent technological advances have reflected the orientation of mills to markets as development has occurred first in the city mills. South Island mills are still important suppliers of the North Island flour market, but their importance has decreased. Mills are at present located close to wheat-growing areas or near markets. The former locations are economic as long as wheat is grown locally in sufficient quantities for their supply. The small size of these mills is in direct contrast to the larger mills closer to the markets. Overall, the South Island mills are smaller than the North Island mills. Considerable economies in the milling process could be obtained by amalgamations of the small mills, whether in city or country areas.
CHAPTER VIII

CONCLUSION

The pattern of flour-mill locations has changed greatly since the first mills were established. In the first twenty years of settlement, mill technology dictated small mills while transport technology prevented long distance haulage. Mills were therefore forced to locate close to the towns that provided their markets, while at the same time remaining close to their wheat supply. Both population and wheat supply dictated the location of the mills and in areas such as the West Coast, where wheat could not be grown, no mills were built. Expansion of mill numbers increased with population growth until 1882.

By 1882 railways had improved communications and permitted cheap movement of large amounts of wheat. The roller mill had the potential for the production of large quantities of flour. These two factors caused many millers to re-examine their beliefs as to the most suitable sites for milling. Some chose to remain in small towns close to where the wheat was grown, while others saw the advantages of a port location, especially when it was close to a sizeable market. By 1900 a contrast in type and location of mills was clearly evident. The port towns of the South Island contained large roller mills that drew wheat from a wide area and sold flour in distant markets. Country mills were
smaller and were dispersed throughout the wheat-growing area. Many had roller plants but others persevered with stone grinding. Competition from the larger mills and problems with local wheat supplies slowly forced many smaller mills out of business.

Several distortions have altered the pattern of mill closures since 1900, two of which were attempts by millers to regulate trade by voluntary reductions of output. The first attempt slowed closures for a few years but the second was more successful and the stability created within the industry gave inducement for new mills to open. Further distortion of the pattern occurred when the Government intervened in the milling trade in 1936 by fixing outputs of all mills and taking control of wheat prices, flour prices and the transport costs involved in the movement of both wheat and flour.

One of the aims of this study has been to investigate the effect that the government regulations have had on the pattern of mill locations. It has been shown that considerable amalgamation of mills has occurred, and the pattern has altered considerably, since 1936. There are, however, several mills that still survive only because of the protected nature of their business. At present the pattern of locations does not involve the Wheat Board in much extra expense as all mills are located between the wheat-producing areas and the markets. These locations are suitable for mills as long as nearby wheat is grown in sufficient quantities to supply the mills.

This study has revealed that the importance of South Island mills as suppliers of the North Island markets has
declined. This has been an outcome of the transfer of quotas to the North Island. As a result of this, and because of amalgamations, the number of South Island mills has fallen dramatically. The location of many of the mills in the study area reflects historical reasons for the choice of site. As machinery and buildings have to be replaced, or as descendants of the founders die, there will no doubt be further closures, particularly of the small country mills.

In this study no information was available on the economics of present patterns of mill locations and quota allocation, since the costs of transporting flour, bran and pollard comparative to wheat are not disclosed by the Wheat Board. Without this information, it is impossible, for example, to know whether South Island mills are viable units for the supply of North Island markets. There is a need for a comprehensive study of the New Zealand milling industry to ensure markets are being supplied by the cheapest means.

A future plan for the optimum location of mills is also desirable so that as mills close, the quota can be used in such a way that total transport costs are minimised. Given the stability of the flour market and its close relationship to population distribution, it would be easier here than in most industries to prepare a plan for the future. Such a plan must do justice both to private enterprise milling companies and to the consuming public. If a new mill is required in an area, the Government and the Wheat Board could co-operate to make loan finance and extra quota available for an existing mill to relocate. In this way, movement could be made towards an optimum distribution
of mills in New Zealand without the severe disruption that would be caused by a re-allocation of all quotas.
ACKNOWLEDGEMENTS

This thesis has only been possible through the assistance given and information supplied to me by various individuals, companies, Government organisations and libraries. Firstly I would like to thank my supervisor, Dr R.G. Cant, who assisted me greatly in structuring my ideas into a logical form.

During questionnaire administration I came into contact with many millers, all of whom gave me their utmost co-operation and were enthusiastic towards my study. Without their assistance much of the information obtained would not have been available. Particularly I would like to thank one particular miller, Mr P. Robinson who stimulated my original interest in the topic. The millers' organisation - the New Zealand Flour-millers' Association also assisted me with information that was required.

Three Government bodies deserve credit for their assistance - the New Zealand Wheat Board, Department of Trade and Industry and the Wheat Research Institute. Particularly I would like to thank Dr Meredith of the latter organisation.

In much of the historical study, libraries were used to a large extent. I would like to thank the staff, particularly the reference librarians of the following:-

Alexander Turnbull Library, Wellington; Canterbury Museum Library; Canterbury Public Library; Canterbury University Library; Hocken Library - Dunedin; Dunedin Public
Library; Press Library, Christchurch, and the National Records Centre, Lower Hutt.

Acknowledgements must go to my mother who has shown enthusiasm towards my studies and to my fellow thesis students in G5 who have kept spirits up. Finally thanks must go to my typist, Mrs Dellow, who put in an admirable performance under severe pressure at the end.

M.J.W.

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APPENDIX I

FLOURMILL QUESTIONNAIRE

Mill

Location and Site:

1. What factors do you consider necessary in the siting of a flour mill?

2. (a) Which of these factors does your mill have?
   (b) Could it have been better located?
   (c) What are the disadvantages of your site? Specify in terms of Cost.

3. What factors as far as you know influenced the original siting of your mill?

Form and Extent:

1. What is the acreage of your property?

2. How much area (approximately) of the total acreage is used for -
   (a) Plant for flour manufacture
   (b) Storage of sacked wheat
       What volume can be stored?
   (c) Storage of bulk wheat
       What volume can be stored?
   (d) Storage of other grains
   (e) Manufacturing other products
   (f) Turning area for trucks, and yard

3. Have you got facilities for handling bulk flour?
4. Has any of your property become redundant under new handling methods, if so, how is it now being used.

5. What was your output in the 1971-72 season for the following:
   (a) Flour
   (b) Bran
   (c) Pollard
   (d) Special flours
   (e) Associated Products

6. If you do not process bran and pollard yourselves, where does it go to?

7. What was your input in wheat in the 1971-72 year?

8. Could you outline the number of shifts the mill works and the labour employed on each, e.g. number of packermen, millers, etc.

9. Is there any seasonal variation on these numbers? How many extra hands are employed in summer?

10. Have you had any trouble getting labour?

11. Has there been any trends in labour requirements over the last 10 years? Could you estimate numerically these changes?

12. Could you estimate how your flour was disposed of in the 1971-72 year, in percentage of total flour produced, under the following categories:
   (a) Local sales to retailers
   (b) Local bakeries
   (c) Local biscuit factory
   (d) Sent elsewhere
   (e) Other

   If flour is sent elsewhere could you outline cities or areas to which you consistently send flour, and roughly what percentage this is of your production. Could you also outline the normal method of transport used in these cases.
History:

1. Has the present mill always been under the same form of management? If not, briefly outline the changes and if possible indicate the reasons for change, e.g. financial, market situation, etc.

2. Has your mill bought out any other mills and taken over their quota, if so, where and when?

3. Have there been any other mills operated in the past by your company but subsequently closed down? If so, where? What date did they close down?

   What were the reasons for closure?

4. Is your mill run in association with any other mill?

5. When did your present mill first operate?

   Did it operate at any other site before that date?

6. Has your plant got any associated product processing facilities?

   If so, what?
APPENDIX II

The Wakanui Mill - A Case Study

The following extracts from the Wakanui Mill, three miles east of Ashburton, have been gleaned from the letterbook of the mill. In 1898 it had been taken over by Thomas Rollitt. As only outward correspondence is entered in the book, information on problems is not complete.

The problem of isolation, particularly the three mile trip to the railway at Ashburton, is evident in much of the correspondence. A copy of the letter to the mill's shipping agents in Lyttelton reads -

"Messrs Pitcaithly and Co.,
Lyttelton.

Dear Sirs,

I have advised you to secure space on 'Joseph Sims' for 20 tons flour. Please secure additional space for 5 tons making in all 25 tons. Kindly let me know 3 or 4 days before she sails as I have to cart to station and must have time for carting.

Yours Truly,
Thos Rollitt"  

The unreliability of departure times of coastal vessels, together with the distance that flour had to be transported to a port, often meant that Rollitt missed the boat. The flour mentioned above could not be sent and Rollitt had to write to the Millers Association in Timaru, from where he got the order in the first place -

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1 Letterbook, 15th January, 1902.
"G. Jamieson, Esq.,
Timaru.

Jan 18th, 1902

Dear Sir,

Pitcaithly and Co. have just wired to send to
'Joseph Sims' not later than Tuesday morning the 20 tons
flour for Wellington. I cannot get the flour carted by
that time so please advise me when to ship.

Yours Truly,
Thos Rollitt"  

While shipping orders were arranged by the Flour-millers'
Association, to which he belonged, there was a considerable
trade done in the local area which appears to have been
arranged by the mill itself. Every month returns were sent
to the Millers Association of shipping orders executed as well a:
daily returns for the month. The latter sales were later called
'local sales'. No details are given but it is assumed that
they were the total of grists, door sales, and sales arranged
by the mill in the local area.

Orders sent to Christchurch are not accounted for spec-
ifically except on a few occasions. It is believed that they
were arranged by the Association and that the 'our' referred
to in the following letter is 'the Association's' -

"Mr Jamieson,
Timaru.

April 9th, 1902

Dear Sir,

Enclosed please find list of forward sales made to
Christchurch bakers by our Christchurch office. I should
have written you before on this matter but Mr Buchanan
was to have been in Ashburton today but did not turn up.
You will see by enclosed list 21 tons have been delivered
in Christchurch, taking Aulsebrook's 3 lot it makes 46
tons. I have explained to you that wheat is difficult to
get hold of and now we shall have to pay at least 3/6 per
bushel. How can I possibly sell flour at £8/10/- with
wheat at 3/6? Wheat alone would cost £8/8/-, sacks 8/-
railway 8/-, discount 8/6. I have protested against for-
ward sales without effect, so please write me what you
suggest in this matter.

Yours faithfully,
Thos Rollitt"  

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2 Ibid, 18th Jan, 1902.
3 Aulsebrooks was a Christchurch biscuit factory.
4 Letterbook, 9th April, 1902. There is a fallacy in this
argument as the income from bran and pollard sales has
not been included in the calculation.
Unfortunately the enclosed list is not included in the letterbook. Forward sales were supposed to have been abolished by the Association but it appears that competition in the Christchurch market had forced the Association to forward sell flour for member millers.

The Wakanui Mill was hampered in 1902 by lack of wheat, to such an extent that it could not fulfil orders. There appears to be no problem of lack of demand for flour from the mill. Often orders received were far in excess of the allotted output, which the mill had been given by the Association. The mill's output was supposed to be 80 tons a month, yet the table below shows how orders received were far in excess of this allotted output -

<table>
<thead>
<tr>
<th>Orders Received</th>
<th>Tons</th>
<th>Orders Executed</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipment</td>
<td>185</td>
<td>Shipment</td>
<td>47</td>
</tr>
<tr>
<td>Christchurch and district</td>
<td>59</td>
<td>Christchurch</td>
<td>13</td>
</tr>
<tr>
<td>Ashburton</td>
<td>47</td>
<td>Ashburton</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>291</td>
<td>Gristes</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

Orders received appear to be 211 tons over the allotted output. This amount may have been caused by the inability of other mills to supply flour, through lack of wheat. Rollitt was particularly upset that orders he could not fulfil were executed by other mills and differences caused through a recent price increase of flour from £8/10/- to £9/-/-, were to be charged to him.

The list also shows that all Ashburton orders were given

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5 Letterbook, 5th April, 1902
6 Letterbook, 2nd May, 1902
7 Ibid, 2nd May, 1902. The table refers to the period 24th March - 24th April, 1902.
priority. Over a year the quantity of flour sold locally would have been more than the amount shipped elsewhere. The list below shows shipping orders sent between December 28th, 1901 and December 24th, 1902. It has been compiled from all shipping orders that appeared in the letterbook between the two dates.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Flour (tons)</th>
<th>Bran (tons)</th>
<th>Pollard (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wellington</td>
<td>97</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>Auckland</td>
<td>49</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Hokitika</td>
<td>32.5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Wanganui</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Plymouth</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gisborne</td>
<td>11</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Greymouth</td>
<td>5</td>
<td>2.5</td>
<td>3</td>
</tr>
<tr>
<td>Napier</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Foxton</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodville</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Westport</td>
<td>3</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Dannevirke</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Pahiatua</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Palmerston North</td>
<td></td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>Kaikoura</td>
<td></td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>242.5</strong></td>
<td><strong>37.0</strong></td>
<td><strong>49.5</strong></td>
</tr>
</tbody>
</table>

The destination of shipping orders was, in 1902, primarily to the large towns in non-wheat growing areas. The West Coast, unconnected by railway until 1923, was the only area of the South Island to which flour and by-products were shipped. Wellington and Auckland were the two major markets for flour while the smaller towns received smaller amounts. These figures represent only one mill and should not be taken as representative of the rest of the South Island mills.

The shipping orders of the year just surveyed were similar
to those of the year 1903, when shipping orders were 202.5 tons. Income is given in the monthly returns for shipping orders and for local sales. The former brought £2,285 in the year, compared to the latter's £2,789. Shipping orders were therefore bringing less income than local sales, which presumably included Christchurch sales. The towns receiving flour in 1903 were similar to those of 1902, with the addition of 13 tons to Blenheim. By 1904, however, only 161.5 tons of flour were shipped.

This declining shipping order may have been a reflection of the falling trade of the Association. In 1904 Rollitt still belonged to it, but frequently he complained over the handling of competition with other mills. Rollitt was occasionally unhappy with the Association but there were obviously several benefits obtained by his membership of it.