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## REVIEW OF MANAWATU FARMING

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### INTRODUCTION

THE MANAWATU is an old-established area of fertile land giving high levels of production under dairy, sheep, beef cattle, and cropping systems. This paper will deal with history, climate, topography, soils, farming types, production levels, amenities, research, current trends, and take a look at the future.

### HISTORY

The early colonization, as with other New Zealand districts, was coastal (Foxton, 1855) but settlers eventually moved up the Manawatu River. An early surveyor, J. T. Stewart, laid out the future city of Palmerston North on a clearing in the virgin cover of dense forest in 1870.

The railway link to Wellington was completed in 1886, and links through the Gorge and to Wanganui in 1891. Foxton was bypassed by the railway and a branch line existed till after the Second World War. Levin and Feilding, being on the railway, have progressed and are now important centres. In the early days many village settlements were planned but few developed to the extent that they were laid out by the surveyors.

Small holdings and small sections have been a hindrance to the development of the Manawatu and, though amalgamations have taken place in recent times, this problem will be mentioned again later in this paper.

### CLIMATE

Typical of the west coast of the North Island, the climate is wet and windy and more reliable than in many other districts but droughts are still possible. The very large exodus from the district of all types of stock in the 1969-70 drought would have surprised even the early settlers.

TABLE 1: METEOROLOGICAL STATISTICS, DSIR STATION, PALMERSTON NORTH

			<i>Rainfall</i> (mm)	<i>Sunshine</i> (h)	<i>Ground</i>	<i>Frosts</i>
Jan.	....	....	80.1	211	—	
Feb.	....	....	64.6	188	—	
March	....	....	65.4	173		1.0
April	....	...	73.3	138		3.0
May	....	....	94.6	112		7.0
June	....	....	99.1	94		11.0
July	....	...	96.4	102		14.0
Aug.	...	..	87.1	123		11.0
Sep.	.	..	68.4	136		6.0
Oct.	...	....	87.9	159		3.0
Nov.	.	..	75.5	175		1.0
Dec.	.	..	99.1	196		—
			991.6	1806		57.0

Meteorological statistics are shown in Table 1 which indicates fairly even monthly totals in rainfall. Rain days are fewer than for other North Island west coast areas. Sunshine hours are higher on coastal areas such as Foxton and Otaki. The Manawatu Gorge is blamed for the cloudiness, but Milson Airport is seldom out of commission.

The winds come mainly from the west, but easterlies can be cold and biting. In 1967 the Wahine storm caused much damage in the Manawatu because it came from a new direction, due south.

Wind run is shown in Table 2. Equinoctial gales in September and March are common but do not raise the monthly totals by much and November is still the windiest month. Comparative figures for other areas are shown.

Because no mountains are near, frosts are not severe. Snow falls close by in May on occasions, but does not last long. The hill country north of here, however, gets several snowfalls a year and much severer frosts.

### TOPOGRAPHY

The Manawatu district, as defined in this paper, includes the counties of Kairanga, Oroua, Pohangina, KIWITEA and Manawatu. It is bounded in the south-west by the Rangitikei River and in the south by the lower Manawatu River, which reaches the sea at Foxton. The crest of the Ruahine and Tararua ranges forms

TABLE 2: AVERAGE WIND RUN (km/day)

	<i>DSIR (P, North)</i>	<i>Kelburn (Wgtn)</i>	<i>Makara</i>	<i>Lincoln</i>
Jan.	286	365	634	327
Feb.	286	356	623	325
Mar.	261	323	599	288
Apr.	256	323	605	293
May	222	322	629	251
Jun.	220	314	616	222
Jul.	211	303	605	230
Aug.	225	327	624	254
Sep.	267	357	632	296
Oct.	298	383	678	323
Nov.	332	3 9 9	705	311
Dec.	285	369	642	323
Av.	262	345	633	287
Days with 34 knots + (Ohakea)	48.0 73.6)	1 8 8 . 4	—	(CH 54.2)

the eastern boundary. The main landscape units within this district are: Tararua and Ruahine ranges, hill country flanking the ranges, Manawatu flood plain, terraces, and coastal sand country.

The Tararua and Ruahine ranges, although not particularly high with a large area below 600 m, consist predominantly of steep and very steep slopes. They are composed of shattered greywacke and argillite and accelerated erosion, especially in the Ruahine Range, is becoming serious and is causing the three catchment authorities affected considerable concern. A special inter-departmental subcommittee of the Soil Conservation and Rivers Control Council has recently reported on this problem. Erosion is increasing on both sides of the Ruahine Range and the buildup of gravel in the forest park and in the rivers is concerning the Manawatu Catchment Board (and other catchment authorities) as this buildup is posing a threat to downstream farmlands and to existing flood control works.

The hill country flanking the ranges is made up of sandstones, siltstones, limestones, and conglomerates laid down in a period when the sea lapped up to the ranges and formed a narrow strait through what is now the Manawatu Gorge, to Hawke's Bay. Continued uplift has occurred, giving the typically contoured New Zealand hill country with predominantly steep and moderately steep slopes.

The Manawatu flood plain has been formed from flood deposits from the Manawatu, Oroua, and Pohangina rivers. These

deposits range from sands on the well-drained levees bordering the rivers to clays in the low-lying backswamp areas away from the rivers.

In some of these backswamps, where the water-table was high throughout the year, peat has accumulated with the alluvium. The Manawatu River is the major river and has a catchment area of 600 000 ha with two-thirds in the southern Hawke's Bay district on the eastern side of the Manawatu Gorge. There are not many examples in the world where a river cuts through a mountain range.

In the past, many high floods have occurred on this flood plain. Those in 1902 and 1953 were the highest recorded, though earlier ones last century may have been higher. Flood levels marked on the old Foxton-Palmerston North Highway at 6 to 7 feet (2 to 3 m) above the road levels give some idea of the height reached by floods and explain why houses were built on high ground or on stilts. With the implementation of the Lower Manawatu Flood Control Scheme, flooding is confined largely to small areas bordering the rivers, although major floods will still inundate the Taonui Basin.

The terrace country is mantled with wind-blown dust or loess which was blown up from aggrading river beds during the last Ice Age. This loess contains some admixture of volcanic ash. The aggradational surfaces from which the loess was derived are represented by stony terraces in the city area of Palmerston North and in the Pohangina, Oroua and Rangitikei river valleys.

Wind deposition has also been responsible for the formation of the extensive coastal belt of sand country which consists of a complex of dunes, sand-plains and peaty swamps. The dunes extend up to 20 km inland and lie parallel to the prevailing westerly wind direction and almost at right-angles to the coast.

## SOILS

The soils of the Manawatu vary greatly in their properties and natural levels of fertility, with the soil pattern closely following the landform units described.

### SOILS OF THE RANGES

The soils of the ranges are mainly steepland soils and yellow-brown earths from greywacke and argillite with shallow and stony profiles. Pastoral farming is carried out successfully on the less leached members (Makara, Korokoro), but those under

higher rainfalls and elevations (Ruahine, Rimutaka, Renata) are marginal for farming and would be best left in protective forestry.

On the easier slopes the soils are formed from wind-blown silts with some volcanic ash and are classed as intergrades between yellow-brown loams and yellow-brown earths (Ramiha). Although strongly leached of plant nutrients and with high phosphate fixation, they are deep, well drained and friable, and pastures on them respond readily to topdressing.

Some of the farms in the ranges have been recently acquired by a consortium of local authorities and also by private timber companies for planting in productive exotic forestry.

#### SOILS OF THE HILL COUNTRY

Hill country soils from Tertiary and early Pleistocene sedimentary rocks occupy only a limited area and consist of yellow-brown earths, intergrades to yellow-grey earths, and related steep-land soils.

Most areas of these soils are developed for semi-extensive and semi-intensive farming with the main limitations being their slope and susceptibility to erosion. Soils with the latter limitation include those from loose, unconsolidated sands (Pohangina, Rau-mai) where severe slip and gully erosion occurs. The well-known Te Awa area includes these soils.

#### SOILS OF THE MANAWATU FLOOD PLAIN

The soils of the flood plain include well-drained recent soils (Manawatu) on the better drained levees, and gley recent (Parewanui, Kairanga), gley (Te Arakura), and organic soils (Makerua, Opiki) in the more poorly drained, low-lying areas. All these soils have high levels of natural fertility but poor drainage and river flooding have been major limiting factors in most of them. Once adequately drained and protected from flooding they can be used for intensive pastoral farming and for cropping.

The Makerua and Opiki soils, formed from mixed alluvium and peat, are particularly fertile once drained and protected from flooding, and are now used intensively for crops of potatoes, onions, and maize.

#### SOILS OF THE TERRACES

Soils of the terraces include gleyed yellow-grey earths in the lower rainfall areas and intergrades between yellow-brown loams and yellow-brown earths in the higher rainfall areas.

The gleyed yellow-grey earths (Tokomaru, Marton) occur where there is a slight summer dry season. The topsoil overlies a clay subsoil with grey colours and iron mottles or concretions indicating poor natural drainage. As a result they are wet in winter but tend to dry out in summer. Natural levels of plant nutrients are moderate but they have low reserves of potassium and pastures respond well to lime, superphosphate, and potash. Farming is mainly fattening lambs and dairying with a moderate amount of annual cropping in rotation with pastures.

The intergrades between yellow-brown loams and yellow-brown earths (Kiwitea, Dannevirke) occur in the Kiwitea, Kimbolton, Apiti and Waituna districts where rainfall is generally higher and the loess contains greater amounts of volcanic ash. These soils are moderately to strongly leached of plant nutrients with high phosphate fixation and low reserves of potassium. They are friable, well-drained soils with good moisture properties so with adequate topdressing they are ideal for both pastoral farming and cropping. Because of these properties, stud stock farms are a feature in the Kiwitea district and horticultural crops in the Kimbolton and Levin districts.

#### SOILS OF THE COASTAL SAND COUNTRY

The soils of the sand country are very variable and this is reflected in their capabilities for land use. Bordering the coast, the soils are young and infertile (Waitarere) and erode readily once the plant cover is disturbed. Use is predominantly urban and exotic protection and production forestry. Where there are large areas of sand plains with a high water-table (Hokio) pastoral farming can be carried out.

Inland, where the soils are older with more organic matter and are more stable, most areas have been developed for pastoral farming. Dairying is carried out where imperfectly drained soils (Pukepuke, Carnarvon) predominate and sheep farming where the more excessively drained soils (Himatangi, Awahou, Motuiti and Foxton) predominate.

#### TYPES OF FARMING

The distinctive features of the farming systems in the Manawatu have been determined by the climate, drainage and flood protection problems, soil fertility and development, and district amenities and organization.

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**DAIRY FARMING**

Dairy farming no longer predominates as it has lost a great number of units in recent years. Twenty-six small dairy companies existed in the billycan and horse and cart days. Early consolidation of these occurred and the sole remaining Manawatu Dairy Company set up its headquarters at Longburn in 1968.

Now with even the private company Glaxo gone out of existence in 1972, all milk goes to the Manawatu Dairy Company. As the town milk industry moved north out of the Hutt Valley to the Horowhenua, so the Jersey cows have been replaced by Friesians and now outnumber Jerseys 3: 1.

Production statistics of the Manawatu Dairy Company show a 50% drop in the number of suppliers in the last decade. Production levels have varied according to the season but 500 kg milkfat per hectare was obtained on the best farms during the 1976-7 season.

**SHEEP AND CATTLE FARMING**

The hill country of the district has improved spectacularly as in other districts.

Stock numbers have increased over the last decade by 30% — not as high as in the younger districts, but total livestock in the area are now approximately 4 million livestock units. Present average carrying capacity is greater than 12 stock units per ha.

Fat lamb farming has been common on the flats and rolling hills of the district. Lambs fatten well on pasture — with white clover helping later in the season. Lambs are drafted from Christmas onwards with a few properties getting a percentage away early although this district is not recognized as an early lamb area.

The intensive rotational grazing system has been adopted by many hill-country farmers and is giving outstanding results in pasture improvement, animal nutrition, and winter growth rates on both the easy and steep hill country.

Cattle fattening has always been prominent, with large numbers coming into the area from outside districts. Friesian and Friesian-cross beef cattle have been fairly popular, with many slaughtered for bull beef.

The Manawatu has always been noted for high quality stock and many stud farms in the various sheep and cattle breeds as well as racehorse stables are well known. Lambing percentages are not particularly high and average between 90 and 100%

depending on the season but some good percentages are recorded on individual farms.

#### CROPPING

Intensive cropping has developed in the Manawatu slowly as is shown by R. K. Coulson in the following paper, There is ample scope for its further development. Because grain growing has been a relatively minor activity, farmers left the firms to provide storage for the grain. The Manawatu Mills and the Longburn Sanitarium factory provided a market for most of the local grain. Now, however, with more crops being grown and maize for grain becoming popular, storage and drying facilities are being built on farms.

Onions and now potatoes have been a feature of cropping in the Manawatu and Rangitikei districts. Bulk handling has taken over in these crops as well as for grain.

Processing has now appeared on the scene with big development plans mooted. The malting process is also on the horizon with 45 000 tonnes of barley required. The local process firm at Feilding predicts it could process 1200 ha of peas, 400 ha of beans, and 100 ha of sweetcorn, and other crops such as tomatoes are being investigated.

Yields of cereal crops have generally been high in the Manawatu with 100 bushels/ac (5.6 to 6.7 t/ha) common in wheat and barley and up to 200 bushels/ac with maize (12.5 t/ha). Process peas have yielded up to 8 t/ha.

#### PRODUCTION LEVELS

There is always danger in quoting production levels without details of the season and the system adopted and generalizations are never satisfactory. However, a few figures will give some indication of levels attained.

#### PASTURE PRODUCTION

To recall past and present local research, pasture production figures obtained from Massey No. 3 Dairy Farm, Marton, Te Awa and Flock House are given.

Grass growth curves differ markedly but rate of growth curves from the Massey No. 3 Dairy Farm are shown (Fig. 1) as being representative of the terrace country.

The early Marton trials measured mean average yields of 10 890 kg DM/ha from 1930-48 (Lynch, 1949) on a gleyed

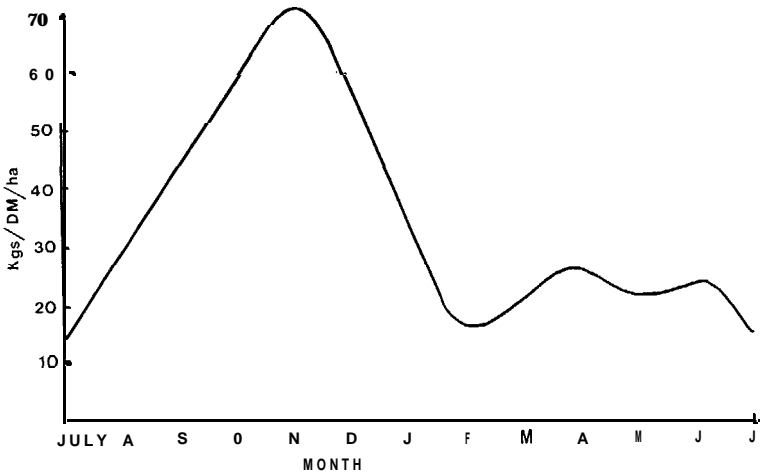


FIG. 1: Average pasture growth, 1971-4, Massey No. 3 dairy farm.

yellow-grey earth (Marton soil), and 10 850 kg from 1955-66 (Radcliffe, 1976).

Seasonal production averages are: winter 12%, spring 40%, summer 35%, and autumn 23%.

At Te Awa, in hill-country experiments on an intergrade yellow-brown earth to yellow-grey earth from sandstone, Suckling (1975) measured large production differences according to the season and according to aspect and contour:

On stock camps from 12 745 to 24 118 kg/ha

Sunny hillsides to 12 817 kg/ha

Shady hillsides to 9 698 kg/ha

with seasonal production averaging: winter 8%, spring, 35%, summer 36%, and autumn 20%.

At Flock House on sand country: A mean pasture production figure of 6 270 kg/ha was obtained on a sandy Himatangi loam and 15 000 to 18 000 on Pukepuke black sand where seasonal results, showed: winter 17%, spring 39%, summer 24%, and autumn 17%.

### LAND VALUES

Land values have skyrocketed here as in other areas. Generally Manawatu values are high but not as high as in other more favoured areas. Dairy farm sales in 1976 averaged \$8.53 per kg of

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milkfat in the Manawatu, exceeded only by the Waikato, South Auckland and Canterbury districts.

Like other districts, urban sprawl has been a problem in the Manawatu. The city of Palmerston North is on a collision course now, looking for space for 30-40 000 extra people. The boom in city values caused a great number of people to migrate to rural areas on to the 4 ha block close to, and not so close to, the city boundary.

#### RESEARCH

Massey University, Grasslands Division and the other divisions of DSIR, Dairy Research Institute, and other research institutes have played a big part in the development of the Manawatu Region. Their contribution to research over the years has been massive and to the welfare of the district quite substantial.

#### AMENITIES

Palmerston North, being a major distributing centre, has assisted in building up good amenities within the Region. The freezing works at Longburn and Feilding have good facilities and are still developing under a merger proposal. Centralized abattoirs are at Feilding. Wool scouring works are at Kakariki, Feilding, and Shannon. Pharmaceutical manufacturers are at Linton.

Fertilizer comes from Wanganui or East Coast works. Lime comes from outside the area, either the Gorge limeworks, or Hatuma or smaller limeworks in Hawke's Bay. Seed dressing plants are at Feilding, Palmerston North, and Marton. Saleyards are at Feilding, Levin, and Rongotea, and annual fairs are held at other centres. Light engineering works are common and heavy industry has recently appeared on the scene.

#### DISTRICT PROBLEMS

##### DRAINAGE

As the area is a flood plain, soils are fertile but wet. One of the main limitations of most soils on flat and rolling land is their poor natural drainage. Drainage is therefore important, but is now becoming a costly operation. With heavy stocking with cattle, feeding pads or platforms are required in wet winters even if the drainage system is effective. The drainage boards' drains in some parts of the Manawatu are receiving attention as, flooding is frequent; more widespread pumping will be required as the local water cannot get into the rivers through closed flood gates.

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**WETNESS**

Wetness affects early spring pasture growth and in cold wet springs nitrogen deficiency shows up throughout the district. Lack of feed and stress in cold stormy weather is severe enough to cause acidosis, ketosis and other metabolic troubles in dairy cows in some seasons.

**SMALL HOLDINGS**

Because it was an early settlement area, small sections and holdings were common. As with small village settlements, many of these early sections are still in existence and, despite amalgamations, farms are still small in comparison with other districts. Small holdings have unlimited land use, but a reduced capacity for capital creation necessary to expand. It is this factor that has contributed to the big variation in farming types — dairy farms, sheep farms, cropping farms and beef farms all alongside one another. Switching from one system to another farming system has been happening regularly, especially in recent times. The competition for land use is increasing and profitability is not the only criterion — as farmers look for easier management systems and like the rest of the community seek more leisure time.

**WIND**

Westerly gales and in some seasons cold easterly gales are a feature of the climate. Macrocarpa shelterbelts have been unsatisfactory and have become casualties. Unfortunately, nothing is being put in their place.

Birds, sparrows and small seed-eating birds, ducks, and now rooks are becoming a menace in the Manawatu, especially with cropping on the increase.

**THE FUTURE****CROPPING**

Highly variable soils and the drainage problems associated with these soils, and the flooding of farm lands make cropping a fairly high risk venture. The higher rainfalls on the west coast also add to the costs by making drying of grain necessary. Lack of heat units makes maize for grain a marginally successful crop. Problems with net blotch in barley have cast doubt on its future unless universal seed treatment and good crop hygiene are adopt-

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ed by all growers. However, good yields can be obtained from these crops in some seasons as previously mentioned, so they will continue to be grown, especially by the cropping specialist.

#### WATER RESOURCES

Rainfall is generally evenly spread throughout the year but much of the Manawatu district often suffers from drought conditions in late summer when crop and pasture growth is slowed down. Supplementary irrigation would be of benefit at these times and underground aquifers can assist for both crop and pasture irrigation. They are giving industrial quantities of water for a few heavy users and attention to quantifying these aquifers is required. With major rivers only 30 km apart and water harvesting a possibility, greater use of water resources will no doubt occur in the future.

A major reorganization of processing in both food and animal products seems imminent. It will stimulate cropping in the Manawatu. What it will do with the livestock industry is anybody's guess. Major markets are handy and ready for some products — e.g., beer and beef — but for others there are many risks involved.

With cropping bound to increase even further in the Manawatu and surrounding districts, pastoral farming may become of lesser importance. Grassland, however, is a major fertility builder and will be necessary somewhere in most cropping rotations. Even short spells in temporary pasture are beneficial so that I can foresee no radical change from the present system of combining some grazing in even the most intensive cropping system.

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