

INTERNATIONAL FARM MANAGEMENT ASSOCIATION

Background and Features of New Zealand Arable Farming in Canterbury

SUMMARY:

In New Zealand most farms are in sole or family ownership.

Climate

- The island climate, with its great variability and unreliability, is a major factor affecting arable crop decisions. The climatic risks are high:
 - Frost
 - Wind
 - Heat
 - Snow and Hail (isolated areas)

ANY ONE CLIMATIC EVENT CAN SERIOUSLY AND ECONOMICALLY AFFECT AND REDUCE PRODUCTION FROM A VARIETY OF CROPS.

- In Canterbury low summer rainfall and potentially high evapotranspiration, makes irrigation essential for high and reliable production.

Soils

- The Canterbury arable industry is mainly built on average to good alluvial soils, with some stone, low to moderate SMHC. requiring irrigation.

Soil Structure

- Maintenance of soil structure is achieved by the use of restorative crops and minimizing destructive soil cultivation practices.
- The use of minimal tillage, including direct drilling.
- The use of break crops and new chemicals for weed control has greatly reduced cultivation.
- The return of crop straw residues can be direct or through stock. There is an economic cost to this as straw has become a valuable buy product to the dairy industry.
- The use of herbage seed production as a method of maintaining and building soil structure.

Water:

- The use of water in NZ and in particular Canterbury is controlled by water rights
- These rights to take underground aquifer water are restricted to maximum take per day, and per season.
- Arable farming, with the use of a spread of crops and highly efficient irrigation systems, sees the take restrictions proving sufficient in most years.
- The effect of “restricted water take” is to make the user more efficient in the use of the water, both in requirement, timing and irrigator type.

Irrigation:

The fragile nature of our more recent soils, and unreliable summer rains make irrigation essential for good production in Canterbury.

The low SMHC of our soils means to maintain a 70% FC we have to apply lesser amounts per application, requiring more even and efficient systems.

The use of variable rate application in conjunction with soil mapping is the next level towards these objectives.

Crops Grown:

- There is a wide range of crops grown on Canterbury arable farms.
- Cereal grains, pulse crops, pasture seed and vegetable seed multiplication.
- A small pharmaceutical and edible oil seed area.
- Fodder crops for sale to the dairy industry.
- Arable farmers use high return crops where possible (bearing in mind they are high return because they are high risk).
- Commodity cereal crops are grown as low risk, good basic crops with ability to get good broadleaf weed control.

Stock Integration:

- Stock feed on arable farms, is grown between arable crops and eaten by stock in situ returning all the nutrient
- The use of stock grazing during the winter and early spring, not only allows the return of crop residues to assist with maintaining structure, **but is essential for the economics** of most arable units.

Marketing:

Under a free and open trade policy New Zealand is open to unrestricted imports, yet have to meet substantial barriers, both financial and non financial when exporting.

Commodities

- Because of our size, with low volumes of production compared with the majority of exporting countries, and our distance from markets (except Australia), exporting grain commodities is not an option.
- They must be grown for our domestic market which is comparatively small, and we are always competing with imported commodities
- However our publicly owned (seeds not under plant breeders rights) herbage seed varieties of ryegrass and white clover, are traded in low volumes as commodities on the world markets.
- Cost of internal transport is high, it is cheaper to move product from the eastern seaboard of Australia to Auckland than from Mid Canterbury.
- The highly competitive nature of our imported commodity grain crops, mainly from Australia, weakens our grain marketing position.

This makes arable farmers price takers in these fields.

Pulse Market:

- New Zealand supplies a small market requirement in pulse crops, mainly into Asia for processing for specialist products.
- Pulse seed multiplication for overseas markets is also a small market.
- Both these areas of production carry a high marketing risk without contract positions.
- The commodities vegetable protein market is highly competitive and low return.

Seed Multiplication:

- Our export potential lies in our unique southern hemisphere temperate climate, where our off (dual) season allows fast turn around of seed multiplication of specialist seeds for the northern hemisphere, traditionally to Europe but more recently Asia also.
- Along with the herbage seed multiplication of northern hemisphere cultivars, New Zealand has had an extensive herbage seed breeding programme, leading to export of pastoral seeds to other countries of temperate climate.

Niche Market

- There are opportunities for niche market supply, especially low volume high value crops, particularly in pharmaceutical and edible oil seed.

Process Vegetables:

- The main crops grown are potatoes, peas, beans and sweet corn- to local processors.
- The process industry supplies the domestic market. Exporting is strongly influenced by supply from larger competitors with New Zealand often filling shortfalls.

Winter Feed Market:

- The growing dairy industry is creating a feed demand which can be satisfied by the arable farms growing and supplying winter feed and grain.
- The supply of winter feed to graze cows through the winter is fed in-situ.
- Influenced by the profitability of the alternative: breeding ewe flocks and lamb trading.

General:

- Free and open trade policy: New Zealand is open to unrestricted imports.
- Our arable farming industry is fragmented, all operating independently.
- Without strong base commodity prices as alternatives to grow our bargaining position is weak.
- Contract positions often means growers are being asked to commit to a pricing structure 15 to 18 months before payment.
- The arable farmer is not being paid for the level of risk that growing many crops carries. Unless this changes soon the future of the industry is uncertain.
- The New Zealand arable farmers are highly skilled in the growing of multiple crops, they are highly efficient, and have a high level of capital invested to limit the effects of the variables in an unreliable Island climate.
- The weakest part of the whole arable operation is marketing for all but a few who have found direct entry to supply specialist markets.

Background and Features of New Zealand Arable Farming in Canterbury (in more detail)

FEATURES:

- The arable industry is a small land user compared with the New Zealand (NZ) pastoral industry. In 2007/2008 season a total of 165,575 ha. was in arable grain and seed production.
- 119,208 ha. (72%) in Canterbury.
- 64,117 ha (39%) in Mid Canterbury
- New Zealand arable areas and yields 2007/08 season.

	NZ	NZ	Canterbury area
Feed wheat	24,500 ha.	250,000 tonne	88%
Milling wheat	16,000	110,000	95%
Barley	51,500	336,000	72%
Other grains	25,800	226,800	24%
			(little maize grown)
Pulse's	12,725	32,800	56%
Herbage seed	30,650		92%
Vegetable seed	4,400		91%

- Feed grains: wheat 250,000 tonne, barley 296,000 tonne and maize 175,600 tonnes, a total of 705,000 tonne.
- Mid Canterbury produces no maize grain, 49% of the feed wheat and 38% of the feed and malting barley.
- Milling wheat for New Zealand: 110,00 tonne, (Mid Canterbury produces 65%), 225,000 tonne is imported, or 67% of New Zealand's requirement.
- Retail value of flour and flour based products, NZ \$1,100 million, export \$117 million, and Mid Canterbury supplies 21.5% of this industry raw product.

OWNERSHIP:

- Most New Zealand Arable farms are based around owner operators, with family ownership structures. These are usually from a series of amalgamations of smaller units, into a size that gives scale of operation. .
- The ability to hold farms in the family takes careful long term planning and a commitment by the existing generation to achieve the hand over.
- If the next generation does not work through the transition with an understanding of the requirements of all in the family, or is not committed to farming, it will not work.
- With family ownership, where the land is to be passed from generation to generation, there is a commitment to the land, and its long term sustainability.

CLIMATE:

- New Zealand has an island climate dominated in the South Island (Canterbury) by a high mountain range and its closeness to the South Pole (43degrees south), and strongly influenced by anti-cyclonic patterns.
- The North Island is influenced by the tail end affects of cyclonic patterns from the Pacific.

Canterbury:

- Canterbury receives most of its rain from the southerly anti cyclonic airflows from Antarctica; they are cold and mainly wet. However the high Southern Alps lift and empty their moisture, creating hot dry winds in spring through to autumn.
- The other moisture bearing weather pattern is the easterly / north easterly: these result from the spent cyclonic patterns to the north that have lost all their strength and often sit around for a period of days with rains or overcast conditions, often for a period at harvest.
- The average rainfall on the mid to lower Canterbury plains is around 650mm, with a range from 450mm to 850mm. The average summer rainfall, November to March is around 250mm +/- 50mm.
- This has to be put alongside the affect of our warm nor'westerly (Foehn) winds that can remove by way of evapotranspiration between 5 and 8 mm moisture per day and can extend for periods up to 5 to 14 days at a time.
- This season saw a period of extreme heat and wind for 6 days from the 18th to the 23rd of December, which switched off many maturing crops and shut them down, cutting 20 plus days off their filling time, to an early harvest.
- We have low spring frost risk in the coastal areas with moderate risk at the top of the plains - however frosts can occur right through to December.
- There is the potential for snow on the upper and mid plains, usually limited to around 300mm + / - 200mm, staying on the ground for a maximum of 20 days (usually only 3 to 4 days). Snow can lay right to sea level in extreme situations.
- There are very localised areas that are affected by hail from thunderstorms that are generally from late growth (November) through to crop maturity (January).

ANY ONE CLIMATIC EVENT CAN SERIOUSLY AND ECONOMICALLY AFFECT AND REDUCE PRODUCTION FROM A VARIETY OF CROPS.

SOILS:

- The majority of the soils used for arable production in Canterbury are recent shallow alluvial soils, with a loessal overlay. Soil Moisture Holding Capacity (SMHC) ranging from 60mm (Lismore soils) to 180mm (Mayfield soils).
- The stone content ranges from virtually nil to very high levels of 70%+
- These are of a largely stony nature and very abrasive, with high infiltration rates, compared to the majority of world arable soils.
- Generally Canterbury arable soils have a natural organic content of 5% to 6% in their grassed - down state.
- Under a 20 year or longer intensive cropping program with full inversion cultivation, the lighter of these soils, with limited or no water, can see the organic matter content potentially drop to below 2%, unless a well balanced cropping program with a high percentage of restorative crops is grown.
- Irrigation over the years has greatly increased foliage and root mass grown, this has greatly reduced the likelihood of this severe reduction in organic matter.

MAINTAINING SOIL STRUCTURE:

- In Canterbury the relatively low moisture holding of the alluvial soils means we have to protect and enhance the soil structure to enable the arable systems to be sustainable.
- The strong nor'west winds can cause severe wind erosion in poor structured soils during plant establishment.
- It is necessary to balance the higher demanding cereal crops and soil destructive crops such as process potatoes and carrots by the highly integrated use of pastoral seed production crops of ryegrass and white clover amongst others.

- The use of neutral affecting crops such as pulses, herbs, vegetable and oil seed crops are also used to lessen the dependence on cereals.
- These oil seed crops tend to be more the high value pharmaceutical, cosmetic and edible oils, rather than industrial (ie not oilseed rape).
- The protection of our soil structure by specialized cultivation techniques that limit the number of passes made by machinery are all part of the integrated system to hold or improve soil structure, and hence improve the organic content of the soils, thus improving soil moisture and fertility holding capability.
- The reduction of cultivation with minimum tillage practices, could see the return to strategic ploughing, unless some excellent and new herbicides can control the grass weeds.
- The return of straw is practiced by some, but straws are a valuable 'by product' of our arable system in supporting our integrated stock policy, as well as providing valuable organic matter: the question is: direct incorporation into the soil or put through stock and returned in the form of dung and urine.

WATER:

- The use of water in NZ and in particular Canterbury, is controlled by water resource consents (water rights): the take of water can be direct from rivers (highly contested by other recreational users), or from the under ground aquifers (highly contested by existing users), both limited by recharge.
- The aquifers are placed into zones (areas of similar recharge), the allocation of water from each zone being based on 15% of the annual rainfall recharge, which represents 50% of rainfall recharge (rainfall actually soaking through to the groundwater) in an average year. In many zones a more refined method is used to set the allocation limit.
- These rights are controlled by a local authority, in Canterbury by the Canterbury Regional Council, ECAN, is the control and policing body.
- Rights to take underground aquifer water are restricted to maximum take per day, and per year. When assessing water permit applications to take water, it will be required to meet a reasonable use test, including; the water requirements of the intended land use activity; consideration of soil moisture holding capacities, rainfall variability and potential evapotranspiration. There is a base irrigation application efficiency of at least 80% even if the actual system is less efficient.
- In the main the maximum take allowed is for the combination of a low SMHC soil, combined with low summer rainfall (near the coast). This combination could allow a maximum take equivalent to 5mm per hectare per day, for up to 120 days of the year.
- Arable with the use of a spread of crop types that have differing water timing requirements, and the upgraded highly efficient irrigation systems, see the take restrictions, proving sufficient in most years.
- The effect of "restricted water take" is to make the user more efficient in the use of the water, both with requirement, timing and irrigator type.

IRRIGATION:

As can be calculated, the low annual rainfall, and the potential for nor'westerly winds to remove up to 7mm moisture per day, coupled with the low SMHC soils, the need for irrigation is essential for reliability of high production and quality.

Most on farm systems have a capacity of 4 to 5 mms per ha. per day.

History:

- Mid Canterbury has been well supplied by irrigation water since the 1940's, after the completion of the Rangitata Diversion Race built in the 1930's Depression. This race takes water from the

Rangitata River south of Mid Canterbury using gravity, across the top of the plains at around 350 to 300 metres elevation, and drops it into the Rakaia River to the north, for hydro electricity generation.

- It was designed to be used for irrigation for the summer months and electricity generation for the high demand winter months.
- The method was border-dyke flood irrigation and was principally for low SMHC soils under pastoral production.
- The uptake was very slow until the introduction of automated flow control and cropping started on the better soils covered by the schemes in the 1950's with the post war food demands, and peaked in the 1970's.
- In the early 1970's the areas not reached by these surface water supplies and natural surface water saw the first water extraction for irrigation from the aquifers below the Canterbury plains, starting near the coast where the wells were shallow (30 + metres deep) using hand shift spray lines.
- Irrigation spread and developed over the next 20 years to deeper wells (up to 100ms deep) and mechanical application by Roto Rainers and Linear booms winched along by hydraulic use of the water pressure.
- These systems are widely used today but have limitations, mainly poor distribution and high labour requirements. The RotoRainer, for example gives poor coverage at the ends of the runs, uneven application in the area between runs. Overall distribution can be uneven also, caused by; limitation of the hydraulic movement in compensation for hose drag and wind pressure effects.

Present day:

- Having looked at the history of irrigation, we move back to present day systems.
- The issue in Canterbury is the large areas of soils with under 100mm SMHC.
- To maintain a level of 60% field capacity (FC) in the soil only 40mm can be applied between 60% and maximum field capacity.
- With potential for periods of nor'west winds removing 5 – 8 mm per day, to maintain 60% FC without movement through the soil profile (leaching) only a 5 - 8 day window exists
- The change from the older irrigation methods to new Laterals and Center Pivots, has been rapid in the last 10 years.
- These efficient application systems can increase production by over 20% on many soils (efficiency of Center Pivots drops off as the length of these irrigators exceed 600m), taking some low SMHC soils from unreliable to very useful production.
- The huge increase in aquifer takes in the last 10years has enabled the majority of arable land to be irrigated. This expansion of irrigation has also bought areas not considered suitable to grow crops into arable production.

CROPS GROWN:

- There is a wide range of crops grown on Canterbury arable farms.
- Cereal Grains: wheat (both feed and milling), barley (both feed and malting), triticale and smaller areas of oats and rye-corn.
- Pulse crops of peas, beans and small areas of lentils. Areas are limited by the need to control the build up of disease, requiring 4 to 8 years between crops.
- Herbage seed multiplication of ryegrass and clovers, with smaller areas of fescue's and cocksfoot. Other specialist pasture seeds are grown in very small areas, as those attending Thursday's field day will see.
- Seed multiplication of many other crops has expanded in the last 10 years, some of these crops grown are: carrots, beet, radish, kale and pak choi, corn salad, phacelia. spinach, buckwheat and chrysanthemums.
- A small pharmaceutical and edible oil seed area is grown each year, including borage, and evening primrose.
- Fodder crops for sale to the dairy industry have become an important crop on many arable farms, with lighter soils enabling in-field utilization, these include kales and beets.

- The New Zealand arable farmers are highly skilled in the growing a multiplicity of crops, they are highly efficient, and have a high level of capital invested to limit the effect of the variable and unreliable island climate.

STOCK INTEGRATION:

- The soils, climate and irrigation allow for arable crop area to be utilized for green feed, sown after harvest in our autumn and fed in situ to stock through the winter and early spring.
- On all but the heaviest soils and the highly specialized farms supplying winter feed to lamb finishing or dairy grazing is vital to the economics of the arable operation.
- **The Lamb finishing trade** is dependent on buying lambs from breeding farms unable to finish, and making a trading margin from buying, finishing and selling lambs.
- Good stock health and good feeding are essential skills arable farmers need to operate these systems well.
- **The Deer finishing trade** is different, in that few irrigated farms have fencing for deer, and therefore the competition for stock is not as fierce. The purchase price is influenced by predicted market returns, and feed levels in the autumn at time of weaning and sale of the weaners.
- **Cattle finishing** is less profitable, so few arable farms trade Cattle.
- **Dairy grazing** is usually combined with specialist full-season winter feed crops being grown as a break crop on many of the lighter stony soils, but soil compaction is an issue on the better soils.

MARKETING ARABLE CROPS:

Under a free and open trade policy New Zealand is open to unrestricted imports, yet has to meet substantial barriers, both financial and non-financial when exporting.

Commodities

- Because of our size, with low volumes of production compared to the majority of our competitors and our distance from markets (except Australia), exporting grain commodities is not an option. They have to be grown for our domestic market, which is comparatively small, and we are always competing with imported commodities
- However our publicly-owned (seeds not under plant breeders rights) herbage seed varieties of ryegrass and white clover, are traded in low volumes as commodities on the world market.
- In Canterbury the distance from our market, including even our domestic market (70% of NZ's population is in the North Island, and the 35 km of sea between the two islands is very costly transport) see imported produce compete heavily.
- It is cheaper to move product from the eastern seaboard of Australia to Auckland than from Mid Canterbury.
- The highly competitive nature of our imported commodity grain crops, mainly from Australia, weakens our grain marketing position.

This makes arable farmers price takers in these fields.

Pulse Market:

- New Zealand supplies a small market requirement in the pulse crops mainly into Asia for processing for specialist products.
- Pulse seed multiplication for export to overseas markets is also a small market.
- Both these areas of production carry a high marketing risk without contract positions.
- The commodities vegetable protein market is highly competitive and low return.

Seed Multiplication:

- Our export potential lies in our unique southern hemisphere temperate climate, where our off (dual) season allows fast turn around of seed multiplication of specialist seeds for the northern hemisphere, traditionally to Europe but more recently Asia also.

- Along with the herbage seed multiplication of northern hemisphere cultivars, New Zealand has had an extensive herbage seed breeding programme, leading to export of pastoral seeds to other countries of temperate climate.

Niche Market

- There are opportunities for niche market supply, especially low volume high value crops, particularly in pharmaceutical and edible oil seed.

Process Vegetables:

- . The main crops grown are potatoes, peas, beans and sweet corn.
- The process vegetable industry has a requirement to supply both the domestic and export market. Because of our distance to market, the requirement for export is strongly influenced by supply from larger competitors, with New Zealand often filling shortfalls.

Winter Feed Market:

- The rapid expansion of the Dairy Industry, in a climate that restricts winter and early spring growth creates a feed demand which can be satisfied by arable farms growing and supplying winter feed and grain.
- The supply of grain can come from all soil types and is readily transported to the point of use.
- However, the supply of winter feed to graze cows through the winter, is more suited to irrigated land (for reliability) with lighter, higher stone-content soils, and within distance of transporting cows to the feed, to use in situ.
- The economics of this feed market are controlled by the dairy milk solids payout (the higher the product value the higher the marginal feed cost can be justified), and is greatly influenced by autumn growth on non irrigated areas (where yields can fluctuate by 100% in feed supplied from season to season).
- Also the profitability of the alternative: breeding ewe flocks and lamb trading.
- This market is generally a farmer to farmer trade, using commission agents to introduce and negotiate between parties.

General:

- Our arable farming industry is fragmented, all operating independently.
- Without strong base commodity prices as alternatives to grow, our bargaining position is weak.
- The huge variability of New Zealand's island climate, and its unpredictable effect on some crops, means we are often not paid for the risk that growing that crop carries.
- Contract positions often means growers are being asked to commit to a pricing structure 15 to 18 months before payment.

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Notes: