

THE C. ALMA BAKER TRUST



REPORT ON ACTIVITIES 2015-2016

THE C. ALMA BAKER TRUST

CHARITIES COMMISSION No. 41732

PUBLICATION No. 39

CONTENTS

Trustees' Preface	1
Foreword	2
Officers of the Trust	3
Charles Alma Baker	4
The C. Alma Baker Trust	5
Summary of Charitable Grants	8
Limestone Downs	9
Map of Limestone Downs	12
Farm Report 2015-2016	14
C. Alma Baker Fellowship	20
C. Alma Baker Research Awards:	26
Research Reports for 2015-2016	26
Research Awards: List for 2016-2017	32
Other Activities Supported by the Trust:	33
Practical Farming Scholarship for United Kingdom Young Farmers	33
2016 Postgraduate Scholarships	34
Scholarships for students specialising in Maori Language at the University of Waikato, Hamilton, New Zealand	36

TRUSTEES' PREFACE

The Trust continued to maintain its core activity at Limestone Downs through the Trust's subsidiary, the C. Alma Baker Trust (NZ) Ltd, particulars of which are covered in the Farm Report. Other activities are also reported, including The C. Alma Baker Fellowship, Research Awards and Scholarships supported by the Trust during the year.

Product prices, especially in the dairy sector, continued to present a challenging situation for the farming operation at

Limestone Downs. Thanks are due to the New Zealand Board members, the management and the staff for their dedicated contributions to the enterprise to enable the continuation of the Trust's charitable activities and other related programmes.

During the year, David Frith retired as Chair and New Zealand Board member having been continuously involved with the Trust since its inception in 1981. Similarly, Roger Moore retired as a Trustee also having been associated with the Trust since its formation and, prior to that, as a trustee of Charles Alma Baker's Estate. Both will be remembered for their outstanding contributions to the Trust and the New Zealand Board.

Dame Margaret Millard has succeeded David Frith as Chair of the New Zealand Board and the Trust has welcomed the appointments of Professor Hugh Blair as a member of the New Zealand Board, and Edward Valletta as a Trustee.

C.R. Boyes
S.F.B. Taylor
D.H. Wynne-Finch
E.F.P. Valletta



Trustees and Directors, 2015

Rear: Barrie Macdonald, Alf Harwood, Tom Mandeno

Middle: Dave West, Margaret Millard,

David Frith, Lachie Johnstone

Front: Roger Moore, Robin Boyes,

David Wynne-Finch, Kevin Lowe

FOREWORD

This was a busy year at Limestone Downs, with better weather conditions than in recent years and the ongoing development of the dairy operation. Improved production was achieved despite animal health challenges. A major project funded by Beef + Lamb NZ involving the use of beef bulls in the dairy system was undertaken at Limestone Downs. Feed conditions meant that stock on the Sheep & Beef unit achieved higher weights than budgeted. For the second consecutive year, 140 per cent lambing was achieved.

In February 2016, Hugh Blair was appointed a Director. Hugh, who is a specialist in animal breeding and genetics, is Professor of Animal Science and Deputy Head of the Institute of Veterinary, Animal and Biomedical Sciences at Massey University.

Scientific research funded by the Trust, and on-farm research continued to attract industry interest, leading to an excellent turnout at the Open Day in February. As well as a farm tour and reports on farm activities, speakers covered a range of projects funded by the Trust or undertaken at Limestone Downs. These included studies on a major beef-breeding project, the causes of humeral fractures in dairy heifers, sheep mortality, and water quality and ecology of the Kaawa Stream.

I would like to thank the Trustees, my fellow Directors, and the management team at Limestone Downs for their support during a very busy year.

Margaret Millard
Chair
Board of Directors

OFFICERS OF THE TRUST

For the year ended 30 June 2016

PATRONS:

Professor Sir Alan Frampton
Mr D. J. Frith
Mr R. Moore

DIRECTORS AND TRUSTEES

Mr C.R. Boyes (Chair)
Mr R. Moore (retired June 2016)
Mr S.F.B. Taylor
Mr D.H.Wynne-Finch
Mr E. F. P. Valetta (appointed June 2016)

DIRECTORS OF C. ALMA BAKER TRUST (NZ) LIMITED

Mr D.J. Frith (Interim Chair, retired February 2016)
Mr L.J.C. Johnstone
Mr K.I. Lowe
Professor B.K. Macdonald (Secretary)
Mr T.G. Mandeno
Dame Margaret Millard (Chair, from February 2016)
Professor D.M. West
Professor H. T. Blair (appointed February 2016)

PROFESSIONAL ADVISORS

Bankers	Barclays Bank plc (Huntingdon, UK) Bank of New Zealand (Pukekohe, NZ)
Investment Advisors..	Canaccord Genuity Wealth Management (London) Craigs Investment Partners (Auckland)
Solicitors	Warren Boyes & Archer (Huntingdon) Rennie Cox (Auckland)
Accountants.....	Buzzacott (UK) Campbell Tyson (Pukekohe)
Auditors.....	Buzzacott (UK) RSM Hayes Audit (Auckland)

CHARLES ALMA BAKER

Charles Alma Baker was born in 1857 in Oamaru, New Zealand, where his parents, migrants from London, built the town's first hotel. Trained as a surveyor, Baker moved to the Auckland province where he continued in his professional employment and married Florence, daughter of Sir Frederick Whitaker, a prominent businessman and former Premier of New Zealand.



Charles Alma Baker

In 1890, Baker moved to Batu Gajah in Perak, one of the Federated Malay States. There, he quickly accumulated a modest fortune through a surveying monopoly over the Kinta Valley which was then the focus of extensive tin mining and rubber plantation development. Baker, always an entrepreneur, invested in both industries, adding to his already considerable wealth.

By the early 20th century, Baker held the largest privately owned rubber plantations in the Federated Malay States. On his plantations and in other agricultural ventures, Baker developed an interest in the preservation and enhancement of soil quality, and in the nutritional value of foods, later becoming a supporter of the early movement for biodynamic farming.

A strong believer in King and Empire, Baker was a prominent fundraiser for the Royal Flying Corps during the First World War, raising funds in Australia and Malaya for the purchase of 94 aircraft, four of which he paid for himself. For this work he received the CBE in 1919.

Financially secure, Baker effectively retired after the War, travelling the world, avoiding winters, and pursuing his interest in fishing. For the first time in more than thirty years, his travels brought him back to New Zealand where he was soon identified as an enthusiast for the developing sport of game-fishing at the Bay of Islands and for trout-fishing on the Tongariro River at Lake Taupo. It was he who persuaded Zane Grey to visit New Zealand in 1926.

On his own 1926 visit to New Zealand, Baker embarked on a farming venture with his nephew, Eric Baker, who was clearing land south of Port Waikato on the west coast of the North Island. As well as buying a controlling interest in Eric's property, Baker bought the large adjoining property which he called Limestone Downs. Over the next 15 years, even during the Depression, Baker invested heavily in these properties which then totalled some 4,800 hectares (12,000 acres).

Charles Alma Baker died in Malaya in 1941 at the age of 84. He last visited New Zealand, and Limestone Downs, in 1940.

THE C. ALMA BAKER TRUST

After his death in 1941, Charles Alma Baker's estate was managed for the benefit of his daughter, Mrs Judy Pottinger. With Baker's generous contributions to the war effort, again for the purchase of aircraft for the Royal Air Force, the loss of rubber income and property damage arising from the Japanese occupation of Malaya, and death duties, the Trustees had little choice after the War but to sell part of the rubber plantations and realise other assets. However, they retained Limestone Downs, recognising its potential as a long-term investment. When Mrs Pottinger died childless in 1976, the Trustees decided to retain Limestone Downs and make it the cornerstone of a trust that would ensure the achievement of the intent of Baker's will – 'the furtherance of the science of agriculture' and wider charitable purposes.

With the agreement of the Charity Commissioners for England and Wales, Baker's Executors formed the C. Alma Baker Trust in 1981 after some two years of discussion with representatives of Massey University. These talks were facilitated by the late Hon. Les Gandar, former Minister of Education and Chancellor of Massey University and, at a critical stage, New Zealand's High Commissioner in London. The new Trust had the aims of 'the furtherance of the science of agriculture; the advancement of education; and such other charitable purposes as the Trustees shall from time to time think fit'.

Linkages between the United Kingdom and New Zealand have remained central to the Trust's activities. Overall control of the Trust, and activities in the United Kingdom, are in the hands of 'the British Trustees'. For the management of Limestone Downs and Trust activities in New Zealand, the Trustees appointed a 'New Zealand Committee' which might include up to three persons proposed to the Trustees by the Vice-Chancellor of Massey University. Reflecting this close partnership, farm management, administrative and financial services were provided for the Trust by the University until 1997; throughout the period, university staff have been involved in significant on-farm research projects.

In its early years, the Trust concentrated on the re-development of Limestone Downs while defining a range of activities that it would fund as financial returns from the property became available. Agricultural research has been a priority, with particular emphasis on seeding grants for new projects and the encouragement of new researchers; as well, there have been a range of scholarships and funds for travel that supports agricultural research and educational linkages between New Zealand and the United Kingdom. Between its formation in 1981, and the conclusion of the period under review, charitable disbursements by the Trust have amounted to some \$NZ7.3 million (£3.3 million) including \$NZ4.9 million (£2.25 million) for research and \$NZ2.1 million (£1.0 million) for scholarships and bursaries.

In 2006, fundamental changes were made to the constitution of the Trust. In the United Kingdom, the Trust became a charitable company, limited by guarantee. The former “New Zealand Committee”, which had administered Limestone Downs and made recommendations to the Trustees concerning Research Awards, Scholarships, Fellowships, and Charitable Grants, was reconstituted as The C. Alma Baker Trust (NZ) Ltd, wholly owned by the United Kingdom-based Trust, and administered by a Board of Directors. In both cases – Trustees and Directors – membership was as before, providing continuity in Trust affairs

SUMMARY OF CHARITABLE GRANTS

	2012-2013	2013-2014	2014-2015	2015-2016
FOR THE FURTHERANCE OF THE SCIENCE OF AGRICULTURE				
• C. Alma Baker Fellowship	15,000	15,000	15,000	30,000
• Research Awards	202,640	186,621	90,000	98,851
	\$217,640	\$201,621	\$105,000	\$128,851
FOR THE ADVANCEMENT OF EDUCATION				
• Postgraduate Scholarships	72,000	52,000	65,000	39,000
• UK Young Farmers to Limestone Downs	30,108	28,210	37,882	41,630
• Maori Language Scholarships	17,000	17,000	14,000	-
• YFC Travel Grant	-	-	-	1,340
	\$119,108	\$83,105	\$116,882	\$81,970
OTHER CHARITABLE AWARDS				
• Malaysian Palm Oil Association –	640	843	940	447
• Royal Smithfield Club	-	-	2,087	-
• East of England Agricultural Society Sponsorship of College Challenge	1,950	2,653	2,200	1,787
• Zimbabwe National Emergency Appeal	-	420	417	447
• Books in Homes (Alan Duff Foundation)	477	392	200	750
• Queen Elizabeth II Diamond Jubilee Trust (NZ)	2,800	-	-	-
• Te Kohanga School:				
- Student Activities	5,000	5,000	5,000	3,000
- Centenary Celebrations	-	1,915	-	-
• Diocese of Waikato	3,900	-	-	-
	\$14,767	\$11,223	\$10,844	\$6,431
TOTAL	\$351,575	\$295,949	\$232,726	\$217,252

LIMESTONE DOWNS

Limestone Downs is a large sheep and beef property situated some 15 kilometres south of Port Waikato. 3,129 hectares (7,954 acres) in area, it is an extremely attractive property with potential for further development. It has a good balance of hills and flats, a wide range of soils varying from peat to volcanic in origin, and a favourable climate. An area of some 400 hectares (1,000 acres) of native bush, once grazed at the margins, has been fenced off for re-generation and future preservation.

Limestone Downs lies on the coast between the Waikawau and Kaawa Streams, extending inland to the Te Akau Line. When the property was purchased by Charles Alma Baker in 1926, more than a third of the land was still in virgin bush and little of the development to that stage had been well planned or executed. The pasture had mostly been lost to the depredations of rabbits and had reverted to weeds. The greatest potential lay in some 200 hectares (500 acres) of swamp country to the south of the farm. There was no direct road access and, for much of the year, the farm was only accessible on horse or by foot. There were few fences, with many of the paddocks being more effectively divided by stands of bush than by fences.

In addition to the purchase price of £30,600, Baker made a heavy investment in bush clearance, fencing, and the draining of the swamp. Within three years, sheep numbers on the property had been increased from 1,800 to 9,000. Baker continued a brisk pace of development despite the Depression of the late 1920s and early 1930s. By 1935, sheep numbers were over 12,000. By the mid-1930s, Baker had invested more than £100,000 in addition to the purchase price; the property carried a mortgage of £40,000 with the balance being covered by capital transfers from Malaya.

After the Second World War, Limestone Downs languished, as Baker's trustees considered the future of his estate, grappled with the problems posed by death duties and wartime shortages, and lived with the threat of a forced sale to government and the subdivision of Limestone Downs for 'Rehab' – the re-settlement of soldiers on the land. By the 1950s, however, there was more optimism with wool prices boosted by the Korean War, debts cleared, successful experiments with aerial topdressing and, in Malaya, a rubber boom that contributed some of the capital needed at Limestone Downs.

The impetus for accelerated development was carried on by Dan O'Connell who was appointed Manager at Limestone Downs in 1950. O'Connell remained until 1973, during which time second-growth bush and scrub was cleared, 'the swamp' (now 'the flats'), were re-developed with heavy earth-working machinery renewing and extending the network of drains; in addition, all fences were replaced, and a new woolshed and yards built together with a new manager's house. The farm could now winter 12-13,000 sheep and 1,200 cattle.

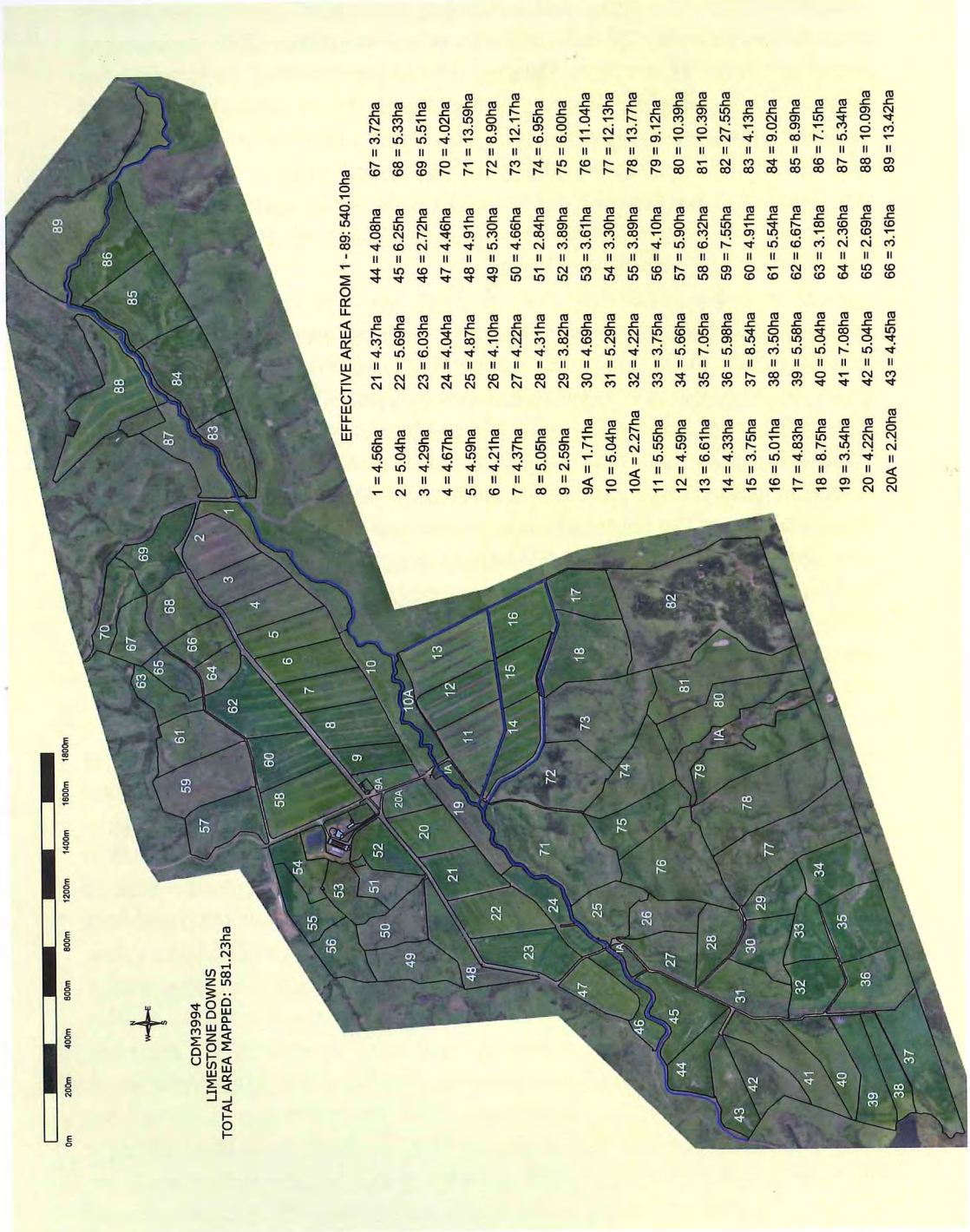
With the establishment of the Trust in 1981, the involvement of Massey University in farm management, and the appointment of Kevin Lowe as Farm Supervisor and Warwick Deighton as Manager, the philosophical basis of the farm's management was radically altered. Rather than being regarded as a 'station' run by extensive farming methods, Limestone Downs was to be farmed intensively. The emphasis was now upon subdivision using electric fencing, smaller paddocks, smaller flocks and herds, rotational grazing and higher performing livestock. To achieve this level of change, stock were assessed and culled on performance, new breeding programmes were established for sheep and cattle, and the farm was an early promoter of a bull-beef initiative using weaner calves from the dairy industry. Vehicle access on the farm was improved, fertiliser needs assessed, and a new water reticulation scheme constructed.

By the early 1990s, the value of the property as a going concern had been improved by 73 per cent in a decade. Under optimum conditions, Limestone Downs could carry 35-36,000 stock units. In 1993, sheep numbers, which had peaked at 30,000 in the mid-1980s, had dropped to 15,000 while cattle numbers had doubled from 2,000 to 4,000. Beef sales accounted for 60 per cent of farm income against 20 per cent each from sheep and wool sales. Under the difficult market conditions of the mid-1990s, returns dropped sharply, and the balance of sheep to beef again shifted. An experimental sheep cross-breeding programme was initiated to ascertain whether breeds other than the traditional Romney might be found more suitable for the conditions at Limestone Downs. As a consequence, the farm has experimented with Finn Dorset and East Friesian crosses with the traditional Romney, an innovation that had a significant impact on stock performance. These developments, and price trends, have led to an increase in sheep numbers and more emphasis on selling lambs for

slaughter rather than store, and a decision to meet all cattle requirements through the purchase of calves (bulls or steers) rather than maintaining breeding cows on Limestone Downs. The sheep-breeding programme has proved very successful, allowing Limestone Downs to capitalise on recent market trends. Following a review of soil fertility on the farm, fertiliser has been applied at significantly above maintenance levels over the past three years, and there has been a strategic application of Nitrogen at critical times of the year to optimise pasture growth. Since 2000, Alf Harwood has been Farm Manager at Limestone Downs.

In recent years, changing market conditions have brought further changes in stock policy. A drop in prices for lamb, and a continuing decline in wool prices, led to ewe numbers being reduced to about 8,000 ewes which, in the 2011-2012 year, produced 11,050 lambs. Mated hoggets produced a further 2,325 lambs. At the same time, overall beef numbers were increased. Under the new policy, some 2,000 weaner calves (bulls and steers), which are sourced from the dairy industry, are purchased annually. In 2007-2008, Limestone Downs experienced the worst drought in living memory; stock performance and pasture conditions were severely affected through into the 2008-2009 season. Further drought in 2009-2010, together with reduced commodity prices and adverse currency movement, affected farm income and the Trust's ability to make charitable awards.

Improved market conditions allowed the Trust to embark on an ambitious pasture improvement programme over 2012-2013, including the humping and hollowing of a significant area of the coastal flats for the first time in fifty years. This became the basis of a dairy conversion with a 300 ha milking platform and rotary dairy shed which was commissioned in 2013. The dairy enterprise operates alongside a substantial sheep and beef operation with 685 cattle sold and 13,000 lambs docked in 2015.



Map of Limestone Downs dairy platform



Map of Limestone Down dairy platform, showing drains/hollows

FARM REPORT 2015-2016

The farm recovered well from the drought with a mild winter and few frosts. However, the early spring had wet and cold periods that slowed growth and the flats went under water in what records show was a one-in-ten year flood. Supplements on the feed-pad were needed to assist the dairy herd.

After mild weather going into summer, there were good rains over December and January – a welcome change from three droughts in a row.

Sheep & Beef:

Ample feed over summer allowed more lambs to be finished and cattle taken on to heavier weights before slaughter.

Lambing results from the ewes was pleasing as feed had been short over mating, and this was the second consecutive year that 140 per cent was achieved.

There was an abortion issue in the hoggets that no amount of veterinary investigation was able to resolve.

Docking 2015

<i>Stock</i>	<i>No. 20 Ram</i>	<i>Sold/ Culled</i>	<i>Ewes Kept</i>	<i>Dry/ Dry</i>	<i>Wet/ Dry</i>	<i>Deaths Culled</i>	<i>Wet Ewes</i>	<i>Lambs</i>	<i>%</i>
MA Ewes	5,712	0	5,712	-44	-237	-370	5,061	8,027	140.53
2th Ewes	2,460	0	2,460	-16	-120	-180	2,144	3,370	136.99
Rec Ewes	235		235	-5	-10	-5	215	371	157.90
Total	8,407	0	8,407	-65	-367	-555	7,420	11,768	139.98
<i>%</i>				-0.77	-4.37	-6.60	88.26		

	<i>In Lamb</i>	<i>Dry</i>	<i>Wet Dry</i>	<i>Deaths</i>	<i>Wet Hgts</i>	<i>Lambs</i>	<i>%</i>
Lambs docked from Hoggets	1,847	-	237	41	1,569	1,834	99.00
Total lambs docked						13,602	

Hogget scanning results for the last ten seasons are summarised as follows:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Twins	388	382	649	1,019	1,372	2,054	1,008	861	952	1,003
Singles	478	512	903	1,982	1,571	1,829	1,989	1771	895	1,038
Drys	284	259	326	1,496	567	544	838	778	1165	867
Total	1,150	1,153	1,878	4,497	3,510	4,427	3,835	3,410	3,012	2,098
Percentage pregnant	75	78	83	67	84	88	78	77	61	70
Twinning percentage	34	33	35	34	39	46	26	26	32	35

Sheep & Beef Sales and Purchases:

These are summarized as follows:

Cattle Sales

391	Steers at	\$1,631
246	Cull cows at	\$1,182
29	Heifers at	\$800

Cattle Purchases

204	Calves at	\$536
400	Calves reared at	\$300
217	Cull cows	\$800

Note: The cull cows and reared calves are transfers from the dairy operation.

Sheep Sales

462	Ewe hoggets at	\$123
2,390	Cull ewes at	\$77
1,304	Store lambs at	\$59
8,972	Works lambs at	\$84

Sheep Purchases

1	Ram at	\$3,500
---	--------	---------

Wool Sales

65,884	Kilograms at	\$4.41/kg
--------	--------------	-----------

Dairy:

A wet and cold early spring with flooding on the flats proved a challenge. Supplements were fed on the pad and, with hindsight, more should have been. Falling cow condition proved a challenge at mating time.

With ample summer feed, the herd gained weight. Facial eczema proved a real challenge with zinc injected into the water supply and added to supplements.

With the Beef Project in partnership with Beef + Lamb NZ and Massey University, no replacement calves were reared while cows and heifers were purchased. This allowed some culling of low producing and high cell-count cows.

Dairy Sales and Purchases:

These are summarized as follows:

Sales

82	Bobby Calves at	\$31
400	Reared Calves at	\$300
20	Cull Cows at	\$1,565
217	Cull transfers at	\$800

Purchases

47	Heifers at	\$727
80	Cows at	\$1,619
29	Heifers transferred at	\$800

Milk Sales

221,921	Milk solids at	\$3.53
---------	----------------	--------

Total Farm Working Account

Farm Income	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Sheep Surplus	868,729	1,170,284	1,010,895	1,097,134	1,042,468	1,068,473
Cattle Surplus	1,273,120	1,292,490	836,291	461,466	843,337	548,862
Wool Sales	148,679	263,650	196,027	222,048	228,417	291,038
Milk Sales	-	-	-	1,079,033	1,015,487	780,716
Dairy Cattle Sales	-	-	-	157,332	101,198	140,569
Sundry Income	37,052	41,155	40,362	43,254	77,489	82,400
Total income	2,327,580	2,767,579	2,083,575	3,060,267	3,308,396	2,912,058

Farm Expenditure	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Farm Working Exp.	902,949	1,124,836	965,923	-	-	-
Repairs & Maint.	152,841	704,551	117,947	-	-	-
Vehicle Expenses	43,276	32,045	38,111	-	-	-
Sheep & Beef	902,949	1,124,836	965,923	747,022	740,638	802,138
Dairy	-	-	-	1,069,302	1,093,243	1,073,500
Administration Expenses	31,928	38,095	38,520	100,099	57,937	61,991
Standing Charges	48,627	51,581	60,746	72,267	76,869	80,863
Total Expenditure	1,179,621	1,951,108	1,221,247	2,128,540	1,968,987	2,018,492
Net Farm Surplus	\$1,147,959	\$816,471	\$862,328	\$931,727	\$1,339,709	\$893,566

Notes:

From 2013-2014, Farm Working Expenses, Repairs and Maintenance, and Vehicle Expenses apportioned to Sheep & Beef and Dairy.

Occupational Health and Safety:

Hazard Co was employed to independently audit systems and processes on-farm. Some minor issues such as signage were identified and these have been acted on.

Research and Extension:

The farm had heavy usage for training, research and extension.

Schools, including Pukekohe High and Te Kohanga, visited to support their agricultural courses, and visitors were hosted from a range of institutions including the Taratahi Agricultural Training Centre. Soil Science students from Massey University also stayed for a week-long course. The farm also hosts bike treks, tramping clubs, Probus groups and Scouts who camped in the shearers quarters to experience country living.

On-farm research which was supported included:

- Ongoing work on hogget lambing with Veterinary Science staff from Massey University.
- Massey researchers have established a predator-free area in the bush to study regeneration.
- A major project funded by the Ministry of Primary Industries to develop techniques for precision application of fertiliser.
- Ecologists monitoring environmental issues associated with the dairy conversion.

Dairy Beef Project:

The Trust has joined with Beef + Lamb NZ and Massey University to undertake a major research project to explore the use of beef bulls in a dairy system. The whole herd will be mated to selected beef sires to assess aspects including ease of calving, gestation length and meat characteristics. This means that herd replacements will be purchased.

The work is now in its second season with some interesting results which will be discussed at the Open Day in February 2017.

Open Day:

The annual Open Day was held in February with about 120 people attending. They were invited to tour either the Dairy or Sheep & Beef farm and to discuss issues with the respective Managers.

Dr Rebecca Hickson, Massey University, reported on the major project with the dairy herd mated to beef sires whose progeny will be finished on the Sheep & Beef farm so that carcass and other measurements can be taken.

Dr Anne Ridler, Massey University, reported on the Trust-funded project at Limestone Downs looking to reduce sheep losses – an ongoing challenge to resolve.

Dr Jennifer Price, an ecologist with Kessells & Associates, reported on a Trust-funded project to monitor stream water quality following the dairy conversion.

Professor David West reported on broken shoulders in dairy cattle which is an issue on some farms from time to time. Causes are not clear and it was agreed the Trust should sponsor further investigation.

STARTING THE 2016-2017 SEASON

The 2015/16 drought ended early enough to provide a good feed position going into the winter. However, the spring arrived with continuous wet weather and little sunlight until mid-October, resulting in poor grass growth and quality as well as poor utilisation.

The dairy herd was particularly affected with falling production and cow condition, only assisted by feeding on the pad.

Although ewes docked 140 per cent, it had been hoped to achieve more as they had been mated in good condition and had good scanning figures.

Lambing Results 2016

<i>Stock</i>	<i>No. to Ram</i>	<i>Sold/ Culled</i>	<i>Ewes Kept</i>	<i>Dry/ Dry</i>	<i>Wet/ Dry</i>	<i>Deaths Culled</i>	<i>Wet Ewes</i>	<i>Lambs</i>	<i>%</i>
MA Ewes	5,205	0	5,205	185	277	347	4396	7383	142%
2th Ewes	2,563	0	2,563	126	135	137	2,165	3,472	35%
Total	7,768	0	7768	311	412	484	6561	10,855	140%

Hogget Lambing

Twins	1,003
Single	1,038
Dry	867
Total	2908
% Pregnant	70
Twin %	35

In total, 13,763 lambs were docked.

C. ALMA BAKER FELLOWSHIP

C. Alma Baker Fellowships are offered to facilitate the travel between New Zealand and the United Kingdom of senior researchers or scholars in the fields of agriculture, agriculture-related technologies, or the study of rural society. It is assumed that a short visit (up to one month) will be made and that the Fellow's salary will be covered from other sources. It is expected that benefits from the visit will accrue more widely than to a single institution. As well as being a contribution to the research/extension programme of the individual, a discernible benefit to agriculture and related fields (broadly defined) in the United Kingdom and New Zealand is expected. The selection of Fellows is based on either expressions of interest from individuals or nominations from colleagues, appropriate institutions or professional societies in either country. The Trust envisages making a single grant for travel to cover fares and expenses for the duration of the Fellowship. Nominations or expressions of interest are invited annually – details are available from the Secretary. There is no prescribed application form; a curriculum vitae for the proposed Fellow, and letters of support from participating institutions should be forwarded to the Secretary. Awards are for \$15,000.

C. ALMA BAKER FELLOWSHIP REPORTS

Two Fellowships were awarded 2015-2016:

Dr Jackie Benschop, Institute of Veterinary, Animal and Biomedical Sciences, Massey University

I am delighted to supply this Report to the C. Alma Baker Trust on my recent leptospirosis Fellowship to the United Kingdom over 1-21 April 2016.

I was hosted by Professor Ruth Zadoks and Drs Kathryn Allan and Jo Halliday at the Institute of Biodiversity, Animal Health and Comparative Medicine, Glasgow University, from 4-15 April. Some of the activities are summarised below:

- Planning with Kath Allan and New Zealand colleagues for a comparative genomics study of *Leptospira borgpetersenii* isolates from Northern Tanzania and New Zealand. This will lead to a joint publication.
- Meeting with Kath Allan and Dr Mark Moseley, University of Aberdeen, for progressing the African Leptospirosis Network; abattoir

studies in selected African countries e.g. Zambia; discussion of the use of screening PCRs and changing primer targets to speciate direct from field samples; differences in roles between endemic/invasive wildlife in host/pathogen specificity; and wildlife trapping. Lead by Kath Allan we will draft a manuscript for the Veterinary Record identifying research needs in Africa from a veterinary public health perspective.

- Discussions with Kath Allan and Jo Halliday regarding biases in culture media and PCRs for *Leptospira interrogans* species; use and visualisation of serology data; cross reaction and dual or more infections. This directly informs the visualisation of New Zealand, Fijian and Nepalese *Leptospira* data at Massey.
- Met with Dr Caroline Millins, Veterinary Pathologist and PhD candidate, regarding persistent symptoms of leptospirosis and similarities with Lyme disease; wildlife trapping and contacts for our new leptospirosis PhD candidate.
- Participated in a telephone conference of the steering committee meeting of the World Health Organisation's Global Leptospirosis Environmental Action Network (GLEAN). Planning for a training workshop in Malaysia in October 2016.
- Discussions with Prof Sarah Cleaveland regarding funding for leptospirosis research and planning for her visit to NZ in October as a Williams Evan's fellow.
- Planning for Kath Allan's visit to New Zealand from Feb to April 2017 as a Wellcome Trust Veterinary Training Fellow.
- Met with Karla Stoffel a veterinary student intern visiting from Tufts University who would like to do an internship at mEpiLab.
- Discussions with Dr Richard Reeve, Jo Halliday and Kath Allan regarding modelling serology data, serological diversity issues and vaccine breakout.
- Met with PhD candidate Ruth Maganga re her antimicrobial resistance project in poultry in Northern Tanzania, with Ruth Zadoks.
- I made a one day visit to the Faculty of Health and Medicine, Lancaster

University hosted by Dr Chris Jewell and PhD candidate Poppy Miller. This was specifically to discuss a proposal to model New Zealand longitudinal *Leptospira* data in sheep flocks to infer infection stage. This will form a chapter of Poppy's PhD and a joint publication. Other discussions included advice on the design of a study of persistent leptospirosis symptoms in New Zealand and environmental survival of leptospires with Dr Roger Pickup.

- With Ruth Zadoks and Kath Allan I made a one day visit to the University of Cambridge, Department of Medicine to Prof Sharon Peacock. Discussions included research priorities for leptospirosis in Africa; antibiotic use in low and middle-income countries and how that affects diagnostic test interpretation; and the Oxford/Mahidol model of collaborative research. I have been introduced by Sharon to staff at Mahidol University in Thailand (Drs Direk Limmathurotsakul and Vanaporn Wuthiekanun) who I plan to visit in October after the Malaysian meeting. Also at Cambridge we met with Prof John Crump University of Otago to discuss the future of the zoonoses lab in Moshi, Northern Tanzania; international research funding; preliminary results from a new study of human *Leptospira* exposure and cattle and rat leptospiral infection in Northern Tanzania.
- I visited the Leptospirosis Reference Centre, Royal Tropical Institute, KIT Biomedical Research, Amsterdam, The Netherlands. Drs Marga Goris and Ahmed Ahmed hosted me and we discussed the African leptospirosis network, the increase in cases in the Netherlands, diagnostics, persistent leptospirosis symptoms and PCR for speciating leptospires. We arranged for our new PhD candidate to visit the reference centre from France.

This Fellowship was a wonderful opportunity for knowledge exchange, planning and to examine our work in New Zealand in a new light.

Dr Lucy Burkitt and Dr Ranvir Singh, Fertiliser & Lime Research Centre, Massey University; Professor Phil Jordan, Ulster University (UK)

This travel grant was used to facilitate a collaborative project between Fertilizer & Lime Research Centre (FLRC), Massey University researchers Dr Lucy Burkitt (Soil Scientist) and Dr Ranvir Singh (Environmental

Hydrologist) and Professor Phil Jordan, Professor of Catchment Science at Ulster University in Northern Ireland. Phil is Principal Scientist for the Agricultural Catchments Programme (ACP) (<http://www.teagasc.ie/agcatchments/>) in Ireland. This large research programme has been established to evaluate the effectiveness of the European Unions' National Action Plan and how Irish farmers can adapt to the Nitrate Directive. The program measures nutrient loss in 6 agricultural catchments, including arable and grassland, with the grassland catchments grazed with sheep, beef and dairy. These catchments vary in terms of their soil type and drainage, allowing the scientists to examine different nutrient loss pathways i.e. nitrate leaching on well drained soils and phosphorus and nitrogen surface runoff on heavier soils.

This research is directly relevant to the research priorities of New Zealand, as agricultural impact on water quality is an issue of national significance and one which can only be tackled at the catchment scale. Phil gave an invited keynote address at the 2015 FLRC workshop in Palmerston North and during a tour of our local agricultural catchments, we discussed the opportunity to collaborate in our research. Phil offered to lend us a high frequency nitrate sensor which would allow us to monitor river water nitrate concentrations every 15 minutes. Real time nitrate sensors are very expensive (around \$30-\$50,000) and not commonly used in New Zealand. Therefore, this arrangement represented a fantastic opportunity to not only gain data that is currently out of our reach, but also to collaborate with a world leader in this field.

In September 2015, Ranvir Singh visited Ireland to attend and present at the International Conference on Catchment Science 2015. Ranvir presented on our group's on-going research to better understand and manage nitrogen flow pathways and its attenuation in the Manawatu River catchment. Most of the presentations at the conference were from the on-going ACP in Ireland, that Phil leads. Ranvir visited some of the catchments which are instrumented with real time sensors and was able to learn about the use and maintenance of these sensors. Ranvir also had detailed discussions with Phil and other ACP team members, Dr Owen Fenton and Dr Karl Richards, about their ongoing research focus, to better manage and mitigate effects of land use on water quality. Their investment and research on intensive and high resolution monitoring of nutrients in waterways is world leading, in terms of understanding water and nutrient flow pathways in our agricultural landscapes.



Ramvir presenting at the International Conference on Catchment Science in Ireland in Sep 2015.



Phil Jordan showing a high resolution nitrate sensor at one of the ACP monitoring sites in Ireland.

The second stage of this fellowship involved Phil delivering the nitrate sensor to Palmerston North in Feb 2016. Phil spent a very fruitful week with Massey staff and students and Paul Peters from Horizons Regional Council (HRC), training us on the sensors use and maintenance. The sensor was installed at the HRC monitoring site in the Manawatu River near the Fitzherbert Bridge and will monitor nitrate concentrations for a full year, until Feb 2017. Data to date is showing interesting diurnal and seasonal changes in nitrate concentrations which were previously not possible to measure, using the standard monthly analysis. The amount of nitrate (in kilograms) flowing down the river using the more detailed sensor data will be compared to calculations based on the standard monthly approach and will inform both HRC and Massey scientists about the benefits of using real time nutrient sensors. As a direct consequence of this collaboration, Massey University are seeking to purchase real time sensors, to continue this important research. A number of media articles were generated from Phil's visit:

<http://www.stuff.co.nz/manawatu-standard/news/76500070/Manawatu-River-sensor-could-revolutionise-nutrient-monitoring>

http://www.massey.ac.nz/massey/about-massey/news/article.cfm?marticle_uuid=A54A083A-9C34-710D-461C-D3E769DD8AB5



Phil Jordan checking pumping equipment with Paul Peters (Horizons Regional Council) at the monitoring site on the Manawatu river, whilst Genevieve Smith and Ross Wallace (Massey University) observe.



Lucy Burkitt, Ranvir Singh, Phil Jordan and Ahmed Elwan (Massey University) discuss a Massey research project near Mangatainoka.

Lucy will present the results from the Manawatu river nitrate sensor research at the Land Use and Water Quality Conference in The Hague, Netherlands in 2017. She will also meet with Phil and members of the ACP in Ireland to see their catchment studies and return the sensor safely to Phil. The C. Alma Baker Fellowship has been instrumental in fostering a very fruitful and ongoing collaboration between the UK/Ireland and New Zealand, which will continue to have very important outcomes for water quality in our country.

C. ALMA BAKER RESEARCH AWARDS

The Trust supports research projects in the fields of agriculture, agriculture-based technologies and the study of rural society. Funds may be granted to provide technical or other support for established researchers. The Trust will not usually fund capital items or the salaries of primary researchers. Applications are invited annually; further details are available from the Secretary.

The Trust has made its awards early in the Calendar year with funds remaining available until 30 June of the subsequent year at which time a report on the research and its outcomes is required.

AL Ridler, RA Corner-Thomas, PR Kenyon, KJ Griffiths
Institute of Veterinary, Animal & Biomedical Sciences, Massey University

FACTORS AFFECTING THE PRODUCTIVE LONGEVITY OF EWES

The project aimed to investigate the association between phenotype, production parameters and productive longevity in ewes, and to investigate causes of weight loss and death in ewes.

As hoggets, the 2010- and 2011-born cohorts of ewes born on Limestone Downs were individually identified (EID tagged) and have subsequently been weighed and body condition scored (BCS) 4 times per year at key management times at pre-mating, pregnancy scanning, pre-lamb and weaning. In addition, their pregnancy scanning results and ability to rear a lamb/s has also been recorded. When study ewes are culled, as per normal farm practice, the dates and reasons for culling have been recorded. Where possible, ear-tags have been collected from dead ewes. A cohort of 50-60 very thin ewes per year have been euthanized and necropsied to identify reasons for weight loss. Thus far we have 4.5 - 5.5 years of data for each ewe.

As at 8 June 2016, amongst the 2010-born cohort of ewes, 364 of the original 3717 ewes (9.8%) were still alive. These have now all been sold to another farm. Amongst the 2011-born cohort, 1311 of the original 4609 ewes remain (28%). Of those ewes that did not remain in the flock beyond four years of age, a greater proportion had died or gone missing than had been culled.

Body condition score (BCS) appears to be having an effect on mortality such that ewes with a BCS <2.5 are less likely to re-appear at the following visit. Further analysis of the complete dataset is required to more fully investigate this.

The main reasons for adult ewes to be prematurely culled thus far are failure to rear a lamb (wet-dry), failure to conceive (dry) and poor condition/ill-thrift. Ewes with poor

BCS or low bodyweights at pregnancy scanning were less likely to successfully rear their lamb/s compared with those that were in better BCS or were heavier.

Amongst ewes that have been euthanized for necropsy, a number of causes of weight loss have been identified. No diagnosis has been possible for around half of the ewes and it is suspected that poor nutrition and/or internal parasites may have been the primary reason for their weight loss. For this reason the recommendation to draft out thin ewes, drench them and feed them preferentially has been reinforced.

All remaining ewes are likely to be culled in the next 6-18 months and at that point a comprehensive data analysis will be undertaken using the lifetime data for each ewe.

To date, the findings have emphasised the importance of ensuring ewe hoggets are at adequate weights for hogget breeding. Limestone Downs has now implemented a policy whereby only hoggets that are 40kg or greater are put to the ram. Results have also emphasised the importance of ensuring that ewe hoggets gain 100-150g/day throughout gestation to improve their success in rearing a lamb and to ensure adequate two-tooth mating weights.

Preliminary results have highlighted the importance of maintaining adult ewes in adequate body condition score to improve their survival and their ability to successfully rear lambs. Limestone Downs now has a policy of body condition scoring ewes at key time periods, separating out lower BCS ewes and preferentially feeding them.

Further funding from the C. Alma Baker Trust was granted and is allowing us to continue to monitor the productive longevity in these ewes. Comprehensive data analysis will be undertaken once we have a complete life-time dataset for each ewe (likely to be in 2017).

AL Ridler, RA Corner-Thomas, PR Kenyon

Institute of Veterinary, Animal & Biomedical Sciences, Massey University

IDENTIFYING THE MAGNITUDE AND CAUSES OF EWE HOGGET AND LAMB DEATHS

The aim of this project is to investigate the timing and reasons for deaths among ewe hoggets and their lambs on Limestone Downs.

Prior to breeding in April 2015, the 3,000 ewe hoggets on Limestone Downs were individually identified with an electronic tag, weighed, and Body Condition Scored. The rams used for breeding were fitted with mating harnesses and the crayon colour was changed after 8 days.

1,103 ewe hoggets were mated in the first 8 days of the breeding period and the intention was to identify up to 600 of these that were found to be carrying a singleton

fetus at pregnancy scanning. These were then to be monitored during the lambing period so that lambs could be matched to dams. All dead lambs and dead ewe hoggets were to be necropsied to identify cause of death.

Unfortunately, at pregnancy scanning it was found that 646 of the 1103 ewe hoggets mated in the first 8 days of breeding were either non-pregnant or had dead fetuses in-utero. Despite investigation the cause/s of these fetal losses could not be identified. This meant that there were only 256 singleton-bearing hoggets in our study cohort, which was not enough to give statistical power to this study. The decision was therefore made to abandon this study for 2015.

The Trust approved the carry-over of residual funds and approved additional funding to allow the study to be continued in 2016. In April 2016, 3,000 ewe hoggets were tagged, weighed and Body Condition Scored and the ram crayon colours were changed on Day 8 of breeding. Approximately 1200 hoggets were bred in the first 8 days and they are due to be pregnancy scanned in July 2016. Assuming there are no fetal loss issues again this year, this project is progressing as planned.

Rebecca Hickson

Institute of Veterinary, Animal & Biomedical Sciences, Massey University

IMPACT OF THEILERIA IKEDA ON GROWTH IN BEEF CALVES

Four herds were identified that were known to have some Theileria infection and that were in areas considered at the time to be moderately infected with ticks. As the tick map has developed, the area in which two farms were located was changed to a high tick area. Calves were weighed and blood sampled at marking in November, in January, and at weaning in March. The two herds in the high tick area had 100% infected calves by marking, so there were no negative control calves in those herds. The other two herds had progressively more infected calves on each occasion but some calves remained uninfected throughout.

In the two herds with control calves, there was no difference in liveweight or average daily gain between infected and control calves. There was also no relationship between Anaemia status or parasite load and live weight or growth rate on any of the farms, despite there being a small number of clinically anaemic calves on the sampling days. One of the farms lost calves to Theileria during the trial period, but they were not in the sampling group. It would appear that Theileria ikeda is not affecting the pre-weaning growth of beef calves in infected herds.

Pip Gerard

Forage Science, AgResearch

BEATING BLACK BEETLE WITH LIME

Black beetle attacks pasture grasses in the northern North Island. With above-average temperatures in the last decade, the beetle has extended its range inland and southward as far as Levin. Formerly a sporadic pest, it has become a more persistent problem for Waikato and Bay of Plenty farmers on peat or light soils even when using black beetle-active ryegrass endophytes. They desperately need additional practical tools to help combat this pest in established pastures.

A new project to develop tools for managing black beetle commenced in 2015 with support from DairyNZ, Ballance Agri-nutrients, Graymont and the C. Alma Baker Trust. One of the tools being investigated is lime application. Preliminary results from a previous project indicated that November lime applications and optimising soil pH for pasture production can reduce the survival of black beetle larvae. Our hypothesis is that as early instar black beetle larvae feed solely on plant detritus in soil, they are sensitive to soil pH and manipulation of pH through lime application. Our initial 2013-15 trials of November lime applications (timed to coincide with hatching larvae) in the field gave promising results. However, they were too variable to allow firm recommendations.

A randomised block lime trial was set up on four farms with soils prone to black beetle (well-drained with high organic matter). Three sites were on commercial dairy farms while the AgResearch farm site was mixed dry stock. At each site, two paddocks were each split into 4 equal plots and 5 tonne/ha of aglime was applied by truck to two randomly selected plots/ paddock in November 2015.

Black beetle populations (and other large soil invertebrates) were sampled 14-18 December 2015 and 26 February-4 March 2016 by taking at least ten 20 cm spade squares \times 15 cm deep/plot. Soil samples were taken in mid-March and analysed by Hills Laboratories for soil nutrient levels, pH and soil organic matter.

The lime applications were effective in raising soil pH (mean 0.18 ± 0.03) in the treated areas by mid-March, with all paddocks showing a response except for an old pasture (>20 years) at Ruakura (Paddock 608) on Motumaoho shallow silty peat (drained phase) with high organic matter levels (~40%).

In December 2015, one month after treatment, there was a significant overall 41% reduction in black beetle larval populations in the limed plots compared to control plots ($P = 0.038$) (Fig. 1a), with most of the decrease attributable to 1st and 2nd instar larvae numbers, but not eggs. This supports our hypothesis that it is the newly hatched larvae that are vulnerable to lime application and/or higher soil pH. However, by late February/early March the treatment effect (mean decrease 25%) was not as strong ($P=0.057$) (Fig. 1b).

Figure 2 shows the results from the individual paddocks. In December strong responses to lime application were seen in one paddock at each site but not the other. This suggests that some other factors also have an influence on the results. The February and March data indicate populations in the dairy pastures all had a tendency to have fewer black beetles in the lime-treated plots while the Ruakura mixed stock pastures did not. This may be linked to pasture composition and soil type, with the Ruakura sites being on old (>20) pastures and heavier soils.

These results reinforce previous findings that November lime applications on peat soils may help prevent black beetle populations reaching damaging levels. While it must be emphasised that lime applications are not a cure for black beetle, the results do show the potential to add to the already well-known benefits of lime in improving soil health and pasture quality, vigour and persistence.

It is known that more acidic soils favour bacteria and are less favourable to fungi. Unpublished laboratory studies have shown newly hatched black beetle larvae, which feed solely on organic matter, have poor survival and weight gain on low pH soil. Soil pH could have some effect on larval gut microbiota subsequently affecting food breakdown. The importance of application of lime in November compared with the effect of pH (lime application any time during the year) is currently being investigated.

In addition to the main lime trial above, a trial established on peat soil at Orini Downs by Murray Lane (Ballance Agri-nutrients) and Paddy Shannon (Farm Consultant) is included in the SFF project. This trial started in November 2014 and consists of three blocks of three adjoining paddocks, each with a different treatment. All pastures were sown in autumn 2014 and are on the same peat soil. The three treatments are:

1. Annual lime at 3t/ha
2. Lime every 3 years (3t/ha to be applied Nov 2017)
3. Control (no lime)

Black beetle abundance was sampled as above in early March 2016. Populations in these 2 year-old pastures have remained low and patchy. While the annual lime treated plots had the lowest percentage increase in black beetle abundance, there have been no significant differences between treatments detected to date.

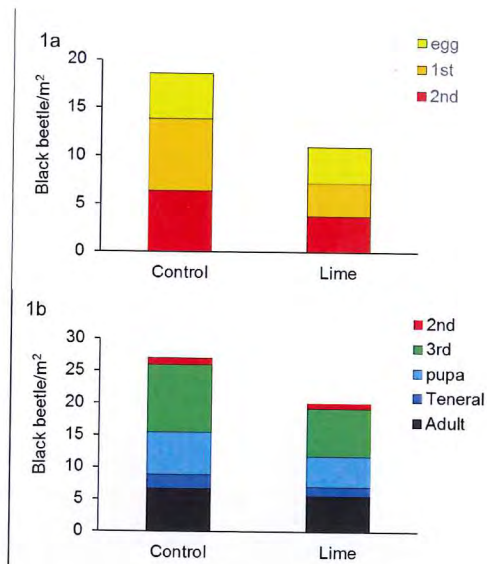


Figure 1: Mean abundance of black beetle a) in December 2015 and b) late February/early March in control and lime-treated plots

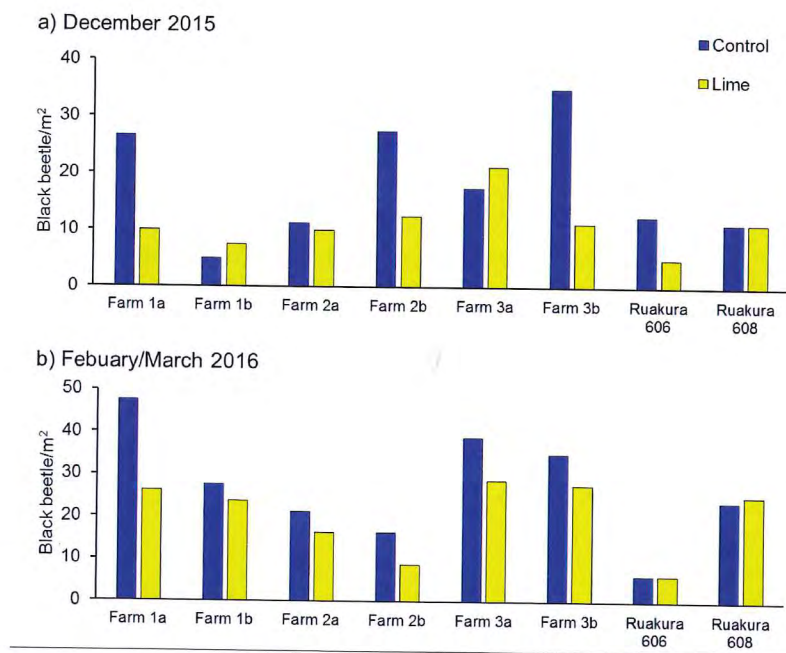


Figure 2: Comparisons of black beetle abundance in control and November lime-treatments in individual paddocks: a) 14-18 December and b) 26 February-4 March 2016.

LIST OF RESEARCH AWARDS FOR 2016-2017

(approved December 2015)

<i>Researcher</i>	<i>Institution</i>	<i>Project</i>	<i>Requested</i>
HEATH, Dr A	Hopkirk Research Inst, Palmerston North	Ecology of Theileria in NZ cattle ticks	\$16,500
HICKSON, Dr Rebecca	IVABS, Massey University	Genetic susceptibility Theileria Ikeda	\$29,260
KENYON, Dr Paul	IVABS, Massey University	Can examining udders really increase flock performance?	\$20,000
RIDLER, Dr Anne	IVABS, Massey University	Factors affecting the productive longevity of ewes; Year 5	\$7,050
Ridler, Dr Anne	IVABS, Massey University	Identifying the magnitude and causes of ewe hogget and lamb deaths	\$26,570
DITTMER, Dr Keren	IVABS, Massey University	Investigating the causes of humeral fractures in NZ dairy heifers	\$15,000
		TOTAL	\$114,380

Note: A 2015-2016 project on the use of herb-clover mix in a combined sheep/dairy environment, led by Dr Rene Corner-Thomas, did not proceed because of crop conditions at Limestone Downs. The balance of grant was refunded.

OTHER ACTIVITIES SUPPORTED BY THE TRUST

PRACTICAL FARMING SCHOLARSHIPS FOR UNITED KINGDOM YOUNG FARMERS

Scholarships are awarded to members of the National Federation of Young Farmers Clubs selected nationally in England and Wales. The Trustees are grateful for the assistance of the NFYFC in the selection process. Each recipient of a scholarship usually spends three months working at Limestone Downs followed by one month's study tour of New Zealand. Each recipient is required to submit a report of his/her experience and to undertake a project.

Up to four scholarships may be awarded annually.
In 2015-2016, the scholarship recipients were:

Alice Victorie Clews
(from July 2015)



Adam Hugh Stockton
(from October 2015)



Kate Elizabeth Williams
(from January 2016)



Dominic Richard Bloxham
(from April 2016)



POSTGRADUATE SCHOLARSHIPS

1. C. Alma Baker Postgraduate Scholarships are available to students enrolled or intending to enrol in masterate or doctoral programmes in the fields of agriculture, agriculture-related technologies or the study of rural society.
2. Depending on funding, up to six scholarships are normally available each year through the Trust reserves the right to make more awards, or no awards in any given year.
3. The award of scholarships will be based on academic achievement.
4. The value of scholarships, currently a maximum \$13,000 a year for a masterate student and \$20,000 a year for a doctoral student, will be reviewed from time to time. For masterate students, funding will be for one year (normally for a course including a significant research component); for doctoral students, awards may be for up to three years subject to satisfactory progress and the provision of regular reports.
5. In awarding scholarships, the Trust may take account of other awards held by the candidates. Candidates must be New Zealand citizens, and graduates of a New Zealand university; awards are available for those intending to undertake postgraduate research either in New Zealand or overseas.
6. At their discretion, the Trustees may make other educational awards from time to time.
7. Applications, which must be on the prescribed form, close on 1 February each year. Forms are available either from the Secretary, or from the Massey University Scholarships Office.

As an investment in the future of agriculture-related research, the following awards were made in February 2016 to recent New Zealand graduates undertaking postgraduate study.

2016 Postgraduate Scholarships

<i>Name and Address</i>	<i>Degree</i>	<i>Topic/Field of Study</i>	
GARDNER, Rachel R	Masterate	Determining the performance of carry-over cows, their longevity and the feasibility of carrying a non-lactating animal as an alternative to raising a replacement heifer	\$13,000
MAHONEY- KURPE, Samuel C	Masterate	Assessing the impact of <i>Epichloe festucae</i> var. <i>lolii</i> infection on the rhizosphere microbiome of perennial ryegrass using high-throughput amplicon sequencing	\$13,000
THOMPSON- MORRISON, Hadee R	Masterate	Cadmium contamination of agricultural soils, and mitigating associated risks to crop cultivation using organic (compost) soil amendments	\$13,000
		TOTAL	\$39,000

**SCHOLARSHIP FOR STUDENTS SPECIALISING IN MAORI
LANGUAGE AT WAIKATO UNIVERSITY, HAMILTON,
NEW ZEALAND**

This Scholarship was instituted following the interest in Maori affairs by the late Hon. Les Gandar, former Chair of the New Zealand Committee of the C. Alma Baker Trust. Scholarships recipients are recommended by a committee chaired by the Bishop of Waikato.

No Scholarships were awarded for 2016

C. ALMA BAKER TRUST PUBLICATION SERIES

Limestone Downs – A Review of the Period 1 July 1981 to 30 June 1984...	Publication 1
Reconnaissance Soil Map of Limestone Downs	Publication 2
Limestone Downs – 1984-85.....	Publication 3
Limestone Downs – 1985-86.....	Publication 4
Limestone Downs – 1986-87.....	Publication 5
Limestone Downs – 1987-88.....	Publication 6
Limestone Downs – 1988-89.....	Publication 7
Limestone Downs – 1989-90.....	Publication 8
Limestone Downs – 1990-91.....	Publication 9
Limestone Downs – 10 Year History.....	Publication 10
Limestone Downs – 1991-92.....	Publication 11
Limestone Downs – 1992-93.....	Publication 12
Limestone Downs – 1993-94.....	Publication 13
C. Alma Baker Trust Workshop	Publication 14
Limestone Downs – 1994-95.....	Publication 15
C. Alma Baker Trust Sheep Breeding Workshop.....	Publication 16
Limestone Downs – 1995-96.....	Publication 17
Limestone Downs – 1996-97.....	Publication 18
Report on Activities – 1996-97.....	Publication 19
Report on Activities – 1997-98.....	Publication 20
Report on Activities – 1998-99.....	Publication 21
The New Zealand AgriFood Industry in International Context – by Professor Jim Leslie	Publication 22
Report on Activities – 1999-2000.....	Publication 23
Report on Activities – 2000-2001.....	Publication 24
Report on Activities – 2001-2002.....	Publication 25
Report on Activities – 2002-2003.....	Publication 26
Report on Activities – 2003-2004.....	Publication 27
Report on Activities – 2004-2005.....	Publication 28
Report on Activities – 2005-2006.....	Publication 29
Report on Activities – 2006-2007.....	Publication 30
Report on Activities – 2007-2008.....	Publication 31
Report on Activities – 2008-2009.....	Publication 32
Report on Activities – 2009-2010.....	Publication 33
Report on Activities – 2010-2011.....	Publication 34
Report on Activities – 2011-2012.....	Publication 35
Report on Activities – 2012-2013.....	Publication 36
Report on Activities – 2013-2014.....	Publication 37
Report on Activities – 2014-2015.....	Publication 38
Report on Activities – 2015-2016.....	Publication 39

Enquiries for the above should be directed to:

The Secretary, C. Alma Baker Trust (NZ) Ltd,
c/o The School of People, Environment and Planning, PN 331,
Massey University, Palmerston North, New Zealand.