ECONOMIC EVALUATION OF MATUA PRAIRIE GRASS
AS A
PASTURE SPECIES ON CANTERBURY SHEEP FARMS

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and
J. E. Chamberlain

Discussion Paper No. 112
September 1987

Agricultural Economics Research Unit
Lincoln College
Canterbury
New Zealand

ISSN 0110-7720
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ACKNOWLEDGEMENTS

The authors would like to thank Mr Tom Fraser of Grasslands Division for the provision of data from the D.S.I.R. trials and Mr John Greer of Ministry of Agriculture and Fisheries, Lincoln for information on the MAF demonstration farmlet.

Local farmers, Messrs Alec Dunlop and Ross Pearce provided practical background information on the management of Matua from the farmers' perspective.

Funding for the study was provided by Grassland Division, Department of Scientific and Industrial Research.
PREFACE

This Discussion Paper provides an example of an economic evaluation of alternative farm production and management systems. The work has been based on scientific trials, combined with some on-farm experience, producing an analysis which highlights the benefits to be achieved from the use of a pasture system incorporating Matua Prairie Grass. The use of the results of this work in the management by farmers of their properties has the potential to lead to significant increases in farm profitability.

This type of analysis is recommended for all new management and production systems. Co-operation between scientists, advisors and economic analysts will lead to more potential to contribute to further useful trials being conducted. As reported in this publication, the trials carried out had some deficiencies from an economic analysis and management point of view. Both these aspects are essential features for farmers if any new technology is to be readily accepted. It is therefore strongly recommended that there be a wider input to the design and conduct of experimental trials with management and economic data requirements being incorporated into the scientific activity.

This publication demonstrates the potential of the new pasture technology - Matua Prairie Grass. It also demonstrates the need for co-operation and consultation between the various disciplines involved in the development and introduction of new technology - scientists, management, economic and marketing analysts.

J.G. Pryde
Director
SUMMARY

Matua prairie grass could play a significant role on Canterbury pastoral farms as a perennial greenfeed. It should not be seen as a substitute for ryegrass/white clover pastures or for lucerne stands but rather as a complement to both. In its role as a perennial greenfeed crop, however, it competes directly with annual forage crops, cereal greenfeeds and specialist ryegrass greenfeeds.

Although Matua has good winter growth potential its susceptibility to trampling and bruising at this time means that it should not be grazed during winter. Its role in the provision of winter feed lies in the fact that by using Matua in autumn during flushing and mating, it is possible to spell ryegrass pastures, allowing them to accumulate dry matter for winter consumption.

Dry matter produced by Matua swards in winter may be consumed in early spring during lambing, while late spring production can be carried forward into the summer.

The rapid response to autumn rain achieved by Matua makes it a more reliable source of feed during flushing and mating than the ryegrass/white clover system.

Matua will not replace lucerne as a drought resistant plant in Canterbury conditions, but will respond to any application of moisture better than ryegrasses.

Because Matua must be spelled between grazings until the plant has regrown to at least 15 centimetres high, and should not be grazed during winter it must be grown in conjunction with ryegrass-based pastures which contribute flexibility to the grazing system.

Trials have been successfully conducted in which 50 per cent of the farm area is sown in Matua but local farm advisors believe that 30 per cent is a more suitable proportion. At that level the grazing system is sufficiently flexible to cope with Canterbury drought conditions and there is sufficient Matua to provide useful quantities of high quality greenfeed at critical periods of the year.

On fertile soils a farming system with up to 50 per cent Matua-based pastures has been shown to be more profitable than a system based on ryegrass pastures only. There is also some evidence which suggests that a system incorporating Matua is economically superior on less fertile soils but this has yet to be proved.
1. Introduction

'Grasslands Matua' prairie grass was placed on the list of Acceptable Herbage Cultivars in 1975. It was bred primarily to provide greater cool season production than other widely used perennial grasses. Other breeding objectives included greater year round production, rapid tillering persistence and disease resistance.

Historically, the role of Matua has been in dairy pastures, but research has shown that it has potential for increasing the total dry matter production on Canterbury sheep farms. However, high production levels will only be achieved if critical management practices are observed.

In the second section of this report, the advantages and disadvantages of Matua are discussed and its role outlined. Ideal management practices for Matua per se are described in Section 3.1 and the management of complementary Matua and ryegrass swards is outlined in Section 3.2.

Grazing trials conducted by Grasslands Division, DSIR are described in Section 4 and the economic values imputed from them are detailed.

In Section 5, a feed budgeting approach to evaluation of Matua as a greenfeed is described and the implications of the comparisons discussed.

2. The Advantage and Disadvantages of Matua Prairie Grass

2.1 Advantages

On Canterbury Sheep farms Matua prairie grass may be used as a complement to ryegrass and as a substitute for traditional annual greenfeed crops. In these circumstances there are a number of advantages and disadvantages associated with the inclusion of Matua in the farming system.

a) On sheep farms, Matua may be used to provide high quality and quantity feed before lambing and providing there is sufficient moisture in autumn, over the mating period. During winter (May until August) Matua grows at least 50% more dry matter than ryegrass pastures under dryland conditions (MAF 1986). This drymatter is used as pre-lamb feed, as will be discussed in Section 3.

b) Unlike ryegrass, Matua remains palatable in the reproductive state. Young stock will consume, and achieve liveweight gains on, Matua at the seed head stage while even adult ewes will not readily eat ryegrass at the same stage. It therefore provides valuable feed for young stock during summer.

c) Matua does not contain the endophyte which causes ryegrass staggers in sheep, and is also resistant to the Argentine Stem Weevil against which the endophyte provides protection. Ryegrass staggers is responsible for reduced levels of stock production, increased time to reach predetermined levels of
production and, in extreme cases, higher death rates amongst stock.

Although it is now possible to sow low-endophyte ryegrasses these do not have good persistence in dryland situations.

The inclusion of Matua paddocks on the farm allows the farmer to continue with more persistent high endophyte ryegrass pastures on the rest of the property because stock can be shifted onto the Matua when staggers appears.

d) More rapid growth response to moisture in the autumn is achieved by Matua than by perennial ryegrasses under dryland conditions. However, in the absence of autumn rain there is no significant advantage over a ryegrass sward. Matua also responds well to irrigation.

e) Matua is very responsive to nitrogen and benefits markedly from strategic autumn and spring applications of Nitrogen fertiliser.

2.2 Disadvantages

a) Drilling of Matua is difficult because of the shape of its seed and the length of its awn. Although clipping of the seed does allow satisfactory drilling, broadcasting is the sowing method usually recommended.

b) Matua pastures do not establish as quickly, or produce as much as ryegrasses during the first season. The Matua sward must be lightly grazed at this time.

c) Matua should not be grazed during winter since the combination of frost and trampling bruises and eventually kills the plant.

d) Matua is more limited in its grazing flexibility than ryegrasses. Although it is possible to graze Matua once before it has recovered from a previous grazing, a second grazing before root reserves have been built up will kill the plant. Regrazing should not take place until the plant is 15 - 20 centimetres in height.

e) The grazing requirements of Matua require 'break' or 'strip' feeding and therefore more labour. Additional fencing materials may also be required.

f) Matua seed requires treatment for head smut before sowing in order to prevent seedling death. The disease usually reappears within twelve months but does not appear to cause plant or animal production loss. It can however be a serious problem for the seed producer. As head smut is difficult to eradicate, the cost of certified seed remains high. In practice Matua seed is taken only in the first year of production.
Matua is more costly to establish than ryegrass. Total seed costs are between two and three times as great as the cost of Nui ryegrass since both the sowing rate and the price per kilogram are greater.

If the critical management conditions in the following sections are violated Matua will have very poor persistence.

Despite its high dry matter production Matua swards may look yellow, open and generally unthrifty. The presence of head-smut accentuates its unfavourable appearance. However, this is only of importance if farmers for whom Matua has potential advantages allow themselves to be discouraged by the appearance of the sward.

Pasture Management

3.1 The Management of the Matua Sward

Although the use of Matua as a pasture species on dairy farms is well documented there is comparatively little published material on the management of Matua under sheep-farming conditions. The management strategy outlined in this section has been formulated on the basis of discussions held with Lincoln based staff of Grasslands Division DSIR, and Advisory Services Division, M.A.F. and with two local sheep farmers who have considerable experience with Matua. Aglink FPP 30 (MAF, 1986) provides a brief practical guide for farmers to the management of Matua.

3.1.1. Winter Management of Matua

Ideally the last grazing of Matua on Canterbury farms should be completed by mid-May but it definitely should not be grazed from the end of May until early to mid August if its full winter growth potential is to be achieved.

Thus Matua pastures provide no winter grazing for a period of at least 60 days.

In August, Matua provides a large quantity of high quality feed for ewes immediately before lambing since it grows approximately 1.5 times as fast in winter as does Nui ryegrass (MAF, 1986). The quantity of feed provided by Matua immediately prior to and during early lambing allows the grazing pressure to be reduced on ryegrass based pastures, thereby allowing these pastures to maximise spring growth.

3.1.2. Spring Management of Matua

After the prelamb grazing Matua appears to experience a period of slow growth. This observation has been made on a farm-level trial carried out by the Ministry of Agriculture and Fisheries on the property of Mr Alex Dunlop at Burnham. It must be noted that in this trial 70 per cent of the farm area was in Matua and any delays in growth would therefore be very obvious. In a normal farm situation where less than 30 per cent of total area is likely to be in Matua such a slow period would probably not be detected. Nor would it be as
important since the ryegrass-based pastures are at their most productive at this time, particularly if they are emerging from the period of reduced grazing pressure made possible by the inclusion of Matua pastures in the farming system.

Because growth at this time of year is slow, Matua pastures will not reach the necessary height, 15-20 cm, for grazing until mid to late October. Therefore, after the pre-lamb grazing, they must be shut up for feed conservation or spelled from grazing for approximately eight weeks.

3.1.3. Summer Management of Matua

During summer the greatest advantage of Matua over ryegrass is its apparently higher palatability although growth rates are also higher than those of ryegrass. Even in its reproductive state Matua is readily consumed by young stock and it is, therefore, valuable as lamb fattening feed. In summer, as at all times it is vital to ensure the critical grazing height of 15 cm is achieved before grazing is resumed.

3.1.4. Autumn Management of Matua

In Autumn Matua pastures can be grazed during mating while ryegrass pastures are spelled to allow accumulation of feed to be carried forward into the winter, thereby minimising the quantities of conserved feed necessary. Matua should not be grazed after the middle of May.

Table 1

<table>
<thead>
<tr>
<th>Critical Management Factors for Matua</th>
</tr>
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<tbody>
<tr>
<td>Grazing Management</td>
</tr>
<tr>
<td>Rotational Grazing with break-feeding and back-fencing</td>
</tr>
<tr>
<td>Grazing Period</td>
</tr>
<tr>
<td>Not longer than four days</td>
</tr>
<tr>
<td>Grazing Interval</td>
</tr>
<tr>
<td>Sward must not be grazed until plant height is at least 15 cm, preferably 20 cm</td>
</tr>
<tr>
<td>Grazing Severity</td>
</tr>
<tr>
<td>Hard 'grazing' ie. down to ground level</td>
</tr>
<tr>
<td>Winter Period</td>
</tr>
<tr>
<td>Minimum June and July. Preferably mid May until early August</td>
</tr>
</tbody>
</table>
3.2. Management of the Complementary Ryegrass/Matua System

The management of the complementary ryegrass/matua system is summarised in Figure 1.

During winter, from mid/end May until early August the ewe flock is rotated on the ryegrass pastures while Matua pastures are spelled.

Immediately before and during early lambing, i.e. from early August until the beginning of September, the Matua pastures are breakfed with a grazing period of no more than four days. The spring flush of ryegrass pastures is at its peak during September and ewes and lambs are set stocked or rotated on these until the end of October. Some pastures, Matua or ryegrass, may be shut up for hay or silage from early September.

Over the summer months both Matua and ryegrass pastures can be included in the rotation. Typically the ewes would be mob-stocked and rotationally grazed to control ryegrass growth. Lambs and replacement stock would be given preferential grazing on both Matua and ryegrass-based pastures as well as on lucerne stands if these were available.

In early Autumn, the ewe flock will still be used to control ryegrass pastures, perhaps with the addition of supplementary feeds to maintain bodyweights. Provided that there is sufficient moisture, Matua provides an excellent source of feed over flushing and mating. Grazing of Matua at this time allows the ryegrass pastures to accumulate dry matter for the winter.

4. Grazing Trials Conducted by Grasslands Division, DSIR

4.1 Grazing Trial Design and Conduct

In 1979 the Department of Scientific and Industrial Research implemented a grazing trial comparing animal productivity on two one-hectare farmlets. Each farmlet was subdivided into ten paddocks and seventy per cent of the area sown in Nui ryegrass and white clover. On one farmlet the remaining three paddocks were sown in Matua and white clover while on the other, 30 per cent of the area was sown in Tama ryegrass. Tama paddocks were resown in November with barley intended for harvest as a grain crop.

Each farmlet was grazed by a flock of mixed-age Coopworth ewes. The stocking rates supported by the farmlets are shown in Table 2.
Table 2

Stocking Rates on Nui/Matua and Nui/Tama Experimental Farmlets

<table>
<thead>
<tr>
<th>Year</th>
<th>Nui/Matua Ewes/ha</th>
<th>Nui/Tama Ewes/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979/80</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Spring and Summer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980/81</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>All seasons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981/82</td>
<td>20 + 5 hoggets</td>
<td>20</td>
</tr>
<tr>
<td>All seasons</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each autumn the ewes were reallocated in order that the mean liveweight per ewe was the same on each farmlet at the beginning of the year.

The ewes were mated to Coopworth rams in early April and to ensure that optimal feeding levels were being maintained were weighed at regular intervals.

On both farmlets, weaning took place in early December, but while weaned lambs continued to graze on the Nui/Matua farmlet until early February, they were removed from the Nui/Tama farmlet at weaning.

Both farmlets were rotationally grazed and the grazing period of the Matua pastures did not exceed four days. The Matua pastures were particularly used for grazing in late autumn and spelled during winter. Lambs, and in 1981/82 the hoggets, were break-fed on Matua paddocks during summer. Tama pastures were also spelled during winter.

Before each paddock was grazed, herbage yield was measured by cutting eight 0.25 metre square quadrats to ground level. All pastures were grazed to obtain high utilisation of herbage.

The trial was radically changed after two years animal production data had been obtained, as the Nui/Tama system was no longer believed to be an economically viable animal production system. It was converted to a dryland comparison of a 100 per cent Nui farmlet with a farmlet consisting of 50 per cent Nui-based paddocks and 50 per cent Matua-based paddocks. During the 'bridging period' of one year between these two experiments animal production data was recorded from the irrigated Nui/Matua farmlet at a stocking rate of 20 ewes and 5 hoggets. No comparative data from a Nui farmlet were recorded as paddocks were being resown in preparation for the dryland trial.

The dryland comparison of a 100 per cent Nui farmlet, with a fifty per cent Nui/fifty per cent Matua farmlet was carried out for one year at two different stocking rates; 13 Ewes/ha and 16 Ewes/ha. Grazing management practices were similar to those outlined for the irrigated trial, except that on both farmlets weaned lambs were carried through the summer.
The herbage and animal production data recorded from these trials are presented in Appendix 3.

Gross margin analysis based on the production data obtained from the irrigated 70:30 Nui/Matua trials has been carried out. It was not, therefore, possible to use feed budgeting techniques to estimate the production which would have been achieved on a comparable 100 per cent Nui farmlet. There was no data available on herbage production on similar soils and under similar climatic conditions. (References: Fraser, T.J., 1984, Fraser T.J., 1985)

4.2. Economic Analysis of Data from Grazing Trials

4.2.1. Comparison of animal production achieved from dryland Nui farmlet and from dryland Nui/Matua farmlet

Detailed gross margins based on the dryland trial data are presented in Appendix 1 and detailed pasture establishment and maintenance costs in Appendix 2. In Table 3 the costs and revenues associated with each farmlet are summarised while the animal production parameters of each trial are shown in Table 4.

Table 3

Gross Margin Summary of Dryland Trials

<table>
<thead>
<tr>
<th>Farmlet Composition</th>
<th>Nui:Matua (50:50)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking Rate</td>
<td>13 Ewes/ha</td>
<td>16 Ewes/ha</td>
</tr>
<tr>
<td></td>
<td>$/ha</td>
<td>$/ha</td>
</tr>
<tr>
<td>Gross Revenue (Sheep)</td>
<td>416.87</td>
<td>523.97</td>
</tr>
<tr>
<td>Direct Costs (Sheep)</td>
<td>154.24</td>
<td>216.66</td>
</tr>
<tr>
<td>Gross Margin before Pasture Costs</td>
<td>262.63</td>
<td>307.32</td>
</tr>
<tr>
<td>Annual Pasture Maint. and Est. Costs</td>
<td>56.46</td>
<td>56.46</td>
</tr>
<tr>
<td>Gross Margin Net of Pasture Costs</td>
<td>206.17</td>
<td>250.86</td>
</tr>
<tr>
<td>Revenue from Hay Sales</td>
<td>579.49</td>
<td>-</td>
</tr>
<tr>
<td>Gross Margin Including Hay Sales</td>
<td>785.66</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 4
Animal Production Data from Dryland Grazing Trials

<table>
<thead>
<tr>
<th>Farmlet Composition</th>
<th>Nui:Matua (50:50)</th>
<th>Nui</th>
<th>Nui</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking Rate</td>
<td>13 Ewes/ha 16 Ewes/ha</td>
<td>13 Ewes/ha 16 Ewes/ha</td>
<td></td>
</tr>
<tr>
<td>Lambing % Survival to Sale</td>
<td>185 181</td>
<td>185 169</td>
<td></td>
</tr>
<tr>
<td>Lamb Liveweight (kg)</td>
<td>25.7 26.8</td>
<td>36.0 25.3</td>
<td></td>
</tr>
<tr>
<td>Wool/Ewe (kg)*</td>
<td>4.0 4.0</td>
<td>4.0 4.0</td>
<td></td>
</tr>
</tbody>
</table>

* Assumed 4 kg Wool/head as wool production not measured by DSIR

Based on data obtained from this trial, at the lower stocking rate (13 ewes per hectare) there is little difference between the net value of animal production under the two systems. At 16 ewes per hectare, the Nui/Matua farmlet has generated a markedly higher net value of production than the Nui farmlet. It should be noted that in this trial all mobs were provided with supplementary feed in the form of hay and barley. The rate per ewe of supplementary feed did not differ between farmlets. Therefore the cost per hectare was higher at 16 ewes per hectare than at 13 ewes per hectare.

4.2.2. Net value of animal production from irrigated Nui/Matua farmlets

In 1979 trials were started to assess animal productivity on an irrigated Nui/Matua (70:30) farmlet. Animal production data were recorded for the two full years 1980/81 and 1981/82. Because replacement hoggets were carried in 1981/82 but not during 1980/81, the earlier gross margin has been adjusted to allow for the costs of purchasing replacements.

Detailed gross margins are given in Appendix 1. Costs and revenues are summarised in Table 5 while animal production data are presented in Appendix 3.
Table 5
Gross Margin Summary of Irrigated Nui/Matua Trials

<table>
<thead>
<tr>
<th>Year</th>
<th>1980/81</th>
<th>1981/82</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking rate/hectare</td>
<td>22 ewes/ha</td>
<td>20 ewes 5 hghts/ha</td>
</tr>
<tr>
<td>Gross Revenue</td>
<td>862.90</td>
<td>759.02</td>
</tr>
<tr>
<td>Direct Costs</td>
<td>216.51</td>
<td>109.65</td>
</tr>
<tr>
<td>Gross Margin before Pasture Costs</td>
<td>646.39</td>
<td>649.37</td>
</tr>
<tr>
<td>Annual Pasture Maintenance and Establishment Costs</td>
<td>102.90</td>
<td>102.90</td>
</tr>
<tr>
<td>Gross Margin Net of Pasture Costs</td>
<td>543.49</td>
<td>546.47</td>
</tr>
</tbody>
</table>

These figures are based on the assumption of an eight year sward-life for Matua and a fifteen year sward life for Nui. However, the sward-life of irrigated Matua is not yet known. If the Matua pastures must be worked up every six years the gross margins will be reduced to $539.69 per hectare and $542.76 per hectare respectively. An increase in sward life to ten years increased the gross margins to $545.75 per hectare and $548.82 per hectare.

4.2.3. Feed-budgeting approach to evaluation of Matua as a perennial greenfeed in dryland Canterbury conditions

In the dryland situation Matua may be seen as a perennial alternative to annual greenfeed crops. In order to evaluate Matua in this role a feed-budgeting approach was assumed. The estimated stocking rate on a farmlet comprising 70 per cent Nui-based pastures and 30 per cent Matua-based pastures was compared with the estimated stocking rate on a farmlet with 70 per cent Nui-based pasture, 15 per cent Tama ryegrass and 15 per cent turnips. The estimates were based on the assumption of 120 per cent lambing. A lower level of stock performance than that which was achieved in the DSIR trials was used in this exercise since it was considered that the average dryland farmer neither achieves nor desires almost 200 per cent lambing.

Dry matter production data for both Matua and ryegrass swards were taken from Ministry of Agriculture and Fisheries estimates (MAF, 1986). These data are presented in Figure 2. The Tama crop was assumed to yield 5200 kilograms of dry matter per hectare (Douglas, 1980). Seventy per cent of this was utilised by stock. A dry matter yield of 6 tonnes of turnips per hectare (Banfield R. Pers. Comm) and a utilisation rate of 70 per cent were assumed in the analysis.
Table 6

Availability of Dry Matter for Grazing on a 100 Hectare Nui/Matua Farm

<table>
<thead>
<tr>
<th>Species</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nui</td>
<td>31248</td>
<td>25088</td>
<td>32984</td>
<td></td>
<td>44576</td>
<td>15120</td>
<td>8680</td>
<td>8680</td>
<td>61572</td>
<td>86800</td>
<td>65520</td>
<td>46872</td>
</tr>
<tr>
<td>Young Nui</td>
<td></td>
<td></td>
<td></td>
<td>8687</td>
<td></td>
<td></td>
<td></td>
<td>9354</td>
<td></td>
<td>33796</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matua</td>
<td>22320</td>
<td>51546</td>
<td></td>
<td>8184</td>
<td>49779</td>
<td>33120</td>
<td>38688</td>
<td>41040</td>
<td>29760</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young Matua</td>
<td></td>
<td></td>
<td></td>
<td>3123</td>
<td></td>
<td></td>
<td></td>
<td>8268</td>
<td></td>
<td>9000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53320</td>
<td>25088</td>
<td>32984</td>
<td>51546</td>
<td>64570</td>
<td>15120</td>
<td>8680</td>
<td>67813</td>
<td>102960</td>
<td>168284</td>
<td>106560</td>
<td>76632</td>
</tr>
</tbody>
</table>

Table 7

Availability of Dry Matter for Grazing on a 100 Hectare Nui/Tama/Turnips Farm

<table>
<thead>
<tr>
<th>Species</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nui</td>
<td>31248</td>
<td>25088</td>
<td>32984</td>
<td>30240</td>
<td>17360</td>
<td>15120</td>
<td>8680</td>
<td>17360</td>
<td>53760</td>
<td>86800</td>
<td>65520</td>
<td>46872</td>
</tr>
<tr>
<td>Young Nui</td>
<td></td>
<td></td>
<td></td>
<td>8687</td>
<td></td>
<td></td>
<td></td>
<td>9354</td>
<td></td>
<td>33866</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turnips</td>
<td>21000</td>
<td>21000</td>
<td></td>
<td>21000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tama</td>
<td>17703</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6300</td>
<td>12600</td>
<td>14700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>31248</td>
<td>25088</td>
<td>32984</td>
<td>30240</td>
<td>47047</td>
<td>36120</td>
<td>47383</td>
<td>33015</td>
<td>66360</td>
<td>135366</td>
<td>65520</td>
<td>46872</td>
</tr>
</tbody>
</table>
Grazing patterns for both Nui and Matua swards were those described in Section 3. The turnips are fed during May, June and July and the Tama from July until October. Estimates of dry matter available for grazing are presented in Tables 6 and 7. Paddocks are made available for grazing in a manner which allows the optimum grazing routine for each species to be observed as nearly as possible. However, there are times when optimum grazing cannot be achieved. For example, on the Nui/Turnips/Tama farm Nui cannot be spelled in autumn to maximise feed carried forward since neither Tama nor turnips provide feed at that time. Grazing restrictions on Matua have not been violated in this exercise.

The feed requirements of stock have been calculated on the basis of 120% lambing, weaning in December and monthly lamb drafts (40%, 30%, 30%) until February. Replacement stock are not carried.

It is assumed that there are 100,000 kilograms of dry matter on hand at the beginning and end of the year and that silage is made in October. Feed carried forward is assumed to deteriorate ten per cent per month. The feed budgets calculated are given in Appendix 4 and summarised in Figures 3 and 4. It should be noted that the quantity of dry matter available in March includes that which is grown during March as well as 100,000 kg carried over. Under the Nui/Matua regime a stocking rate of 11.2 ewes per hectare is sustainable. At that stocking rate the levels of dry matter on hand at the beginning and end of the year are identical and the dry matter grown during the year equals the dry matter required by the stock. The Nui/Tama/Turnips farm supports 7.85 ewes per hectare.
Gross margins based on this feed budgeting exercise are detailed in Appendix 1 and summarised in Table 8. It can be seen that the Nui/Matua farm has a higher level of profitability than the Nui/Tama/Turnips farm because of its higher productivity and lower costs of cultivation.

Table 8
Gross Margin Summary of Dryland Greenfeed Alternatives

<table>
<thead>
<tr>
<th>Farmlet Composition Stocking Rate</th>
<th>Nui:Matua (70:30) $/ha</th>
<th>Nui:Turnips:Tama (70:15:15) $/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Revenue (Sheep)</td>
<td>327.87</td>
<td>230.26</td>
</tr>
<tr>
<td>Direct Costs (Sheep)</td>
<td>103.43</td>
<td>73.27</td>
</tr>
<tr>
<td>Gross Margin before Pasture Costs</td>
<td>224.44</td>
<td>156.99</td>
</tr>
<tr>
<td>Annual Pasture Maintenance and Establishment Costs</td>
<td>59.54</td>
<td>96.98</td>
</tr>
<tr>
<td>Gross Margin Net of Pasture Costs</td>
<td>164.90</td>
<td>60.01</td>
</tr>
</tbody>
</table>

5. Discussion

Matua Prairie Grass has an economically viable place on Canterbury sheep farms as the results presented in this paper demonstrate. Further research is needed to determine the extent of this role.

In the complementary Nui/Matua system the role of Matua has two facets. Firstly it contributes directly to the annual dry matter yield. It is generally conceded that Matua has the ability to outyield perennial ryegrasses except in spring when growth rates are similar (White, 1985). This was demonstrated in the irrigated trials in which the annual yields of Matua exceeded the annual yields of Nui by approximately 15 per cent.

Secondly inclusion of Matua in the rotation allows better management of rye-grass based pastures which are therefore able to achieve higher yields. As can be seen in Table A.3.1. the Nui/Matua systems outyielded the Nui only systems at both stocking rates under dryland conditions although on Nui/Matua farmlets there was little difference in production between the two species.

The third contribution of Matua to the dryland farming system is as a perennial greenfeed. The feed-budgeting exercise described in Section 4 shows that Matua has significant advantages over the combination of Tama and Turnips as a greenfeed. The exercise understates the advantages of Matua in as much as it does not take account of the superior quality of Matua in the reproductive phase and, therefore, of its contribution to lamb fattening. In a dry year the advantages will be rather less since Matua will not contribute as great a quantity of flushing feed in autumn as in wetter years.

The grazing trials conducted by DSIR to assess the Nui/Matua system under irrigation have produced extremely high levels of animal production. However it is not possible to determine the superiority of
this system over one based on Nui ryegrass since comparable Nui results were not generated by the experiment.

As has been noted previously, Matua outyielded Nui in both of the irrigated trials. Since the restrictions imposed on the rotation by the use of Matua in 50% of paddocks could be met under dryland conditions while maintaining economic superiority over the Nui alone system it is at least probable that the Nui/Matua system would be superior under irrigation.

The dryland grazing trials described earlier have generated the data required to compare the Nui/Matua system with one based on Nui alone. At thirteen stock units per hectare the superiority of the Nui/Matua system is demonstrated, only in the large quantities of hay harvested, other than in higher profitability from livestock. At sixteen s.u. per hectare the profitability of the livestock enterprise based on Nui/Matua is clearly higher. One possible explanation for the similarity of stock production at the lower stocking rate lies in the fact that there was a particularly high summer rainfall during 1982/83 when the trial was conducted. Both systems were understocked and the sheep were, therefore, supplied with optimal quantities of feed under each.

The use of Matua on dryland farms in Canterbury requires further evaluation under a range of climatic conditions and across a range of soil types. In Canterbury where rainfall is highly variable and the probability of drought high, farmers require objective information on the performance of Matua under dry conditions in order to assess the risk associated with this type of system.

In addition, it has been suggested (White, 1985) that the advantages of Matua may only be evident on soils of high fertility. The Templeton Silt Loam on which the trials were conducted is one of Canterbury's better soils and has, according to the M.O.W.D. Land Use Capability Survey, a potential carrying capacity of 25 s.u. per hectare under irrigation and 22 stock units per hectare under dryland conditions. The Ministry of Agriculture and Fisheries at Lincoln with co-operation of a local farmer, conducted a two year demonstration comparing a 70 per cent Matua/30% Nui farmlet with a Nui alone farmlet on Lismore soils under dryland conditions. This demonstration had some methodological defects, particularly in the first season, but although these tended to favour the 100 per cent Nui system, higher levels of productivity and profitability were achieved on the Nui/Matua system. This trial is described in Appendix 5. Lismore soils are very much lighter soils than Templeton soils and are estimated to have a potential carrying capacity of 10 stock units per hectare under dryland conditions.

While this demonstration cannot be considered conclusive proof that Matua is of value as a pasture species on lightland without irrigation, it does suggest that it may be of use on a wider range of soils than was previously believed.

Although the MAF demonstration indicates that environmental limitations on the use of Matua are not severe, its managerial requirements do limit its application. While the productivity and persistence of ryegrass swards are reduced by poor grazing management they will survive overgrazing. Matua can survive being grazed once before it has reached its critical grazing height of 15-20 centimeters but a subsequent regrazing before root reserves have been replenished will kill many of the plants. Similarly, prolonging the grazing period beyond the four day maximum will result in plant death as a consequence
of hoof damage. Thus Matua is likely to be grown successfully only by those farmers capable of managing an intensive rotational grazing system. In 1982 a MAF survey showed that approximately 50 per cent of farmers in Canterbury operated some type of rotational grazing system. Local advisors believe that only 20 per cent are presently capable of the level of grazing management suitable for Matua. (G Scales pers.comm).

Trials carried out by the DSIR have tested systems with 30 per cent and 50 per cent Matua. Both of these allow sufficient management flexibility to meet stock feed demands without compromising the grazing intervals or grazing periods of the Matua or ryegrass swards. Although the MAF demonstration farmlet was 70% Matua, local advisors agree that meeting grazing constraints would be extremely difficult if Matua-based pastures comprised more than 50 per cent of the farm.

In summary, a farming system incorporating up to 50% Matua-based pastures with the remainder in ryegrass-based pasture has been shown to be economically superior to a system based solely on ryegrass, on fertile soils. There is strong evidence to suggest that such a system is also economically superior on less fertile soils, but this remains to be validated in scientifically conducted trials.

Using a feed-budgeting approach it has been shown that a Nui/Matua system is less costly and more productive than a system in which Nui is supplemented by annual greenfeed crops.

The greatest limitation on the successful implementation of the Nui/Matua system is likely to be the ability of the farmer to meet the grazing management requirements of the Matua-based sward.
6. Suggestions for Future Research

In the course of assessing the economic implications of the Matua grazing trial, it became apparent that a number of aspects other than scientific validity determine the extent to which such trials can be reported meaningfully to farmers and the extent of economic analysis possible. These include:

1. Replication

One of the objectives of this trial was the assessment of Matua's suitability as a pasture species for dryland Canterbury. The most difficult environment factor for the dryland farmer in Canterbury is the extreme variation in annual and seasonal rainfall. In assessing pasture species, he is, therefore, concerned with performance under a wide range of rainfall conditions. Evaluation of Matua's performance in any single year is unlikely to provide a result which is meaningful for him. For example, the dryland section of this trial was conducted in a year when summer rainfall was so high that at thirteen stock units per hectare, the net returns from sale of surplus hay exceeded those from the livestock enterprise.

While it may be possible to assess the suitability of a species for a particular location without within-year replication, it is not possible to assess its suitability for "dryland Canterbury" based on its performance on a high fertility soil such as a Templeton Silt Loam. Economic assessment on a regional basis would be more cost effective and very much more meaningful providing that resources are available to allow replication on representative soil types.

2. Data Collection and Recording

Where trials are intended to reflect performance under current farming practices, and to be evaluated in an economic framework, it is essential that all the information which is important in a farm management context be collected. Whether or not it is valid in a scientific context to disregard 'treatments' which are applied equally to control and test farmlets, details of such 'treatments' are important to farmers who may expect to achieve similar levels of performance to those described by researchers.

In this trial it was assumed that there would be no difference in wool production from ewes with bodyweights as high as those in the trials. This assumption may or may not be valid. However, wool is a very significant part of sheepfarm income and the fact that production levels have not been recorded reduces credibility from the farmer's viewpoint. All important production parameters should be measured.

Another aspect of data collection to be considered is that data should, where possible, be comparable with other trials and tailored to different forms of analysis to allow extrapolation from trials results to other situations. In one year of this trial, data were collected on animal production from an irrigated Nui/Matua farmlet. There was no 'Nui only' comparison. Had herbage production data been collected as well as 'herbage offered' data it would have been possible to derive a comparable Nui only situation using feed-budgeting techniques.

3. Scale

One hectare farmlets are too small to escape the charge, however unfair, that the management input is likely to have been much
greater than would be possible in a typical farming context. Although larger experimental blocks are likely to be ruled out immediately on grounds of cost, a compromise solution may be possible.

In the last Appendix of the report, a Matua grazing demonstration run by the MAF Advisory Services Division at Lincoln is briefly described. The validity of the results obtained from this demonstration was limited because several of the practices employed invalidate the comparison between the farmlets studied.

In the case of the Matua trial carried out at Lincoln, it may have been possible to combine these two exercises, with MAF providing farm management expertise and the DSIR, scientific expertise.

4. Trial Objectives

The objectives of this trial changed during the years of its implementation as changing farming practices made earlier objectives obsolete. This is inevitable with a number of longer-term projects. However, where this happens, it is most important to consider what use data collected in any one year are going to be. During the year when the irrigated Matua trial was converted to a dryland trial, animal production data and some herbage data were collected. There was, however, no control farmlet from which data for comparison could be collected. It could be argued that in such circumstances only minimum resources should be employed during the transition phase since the return on such resources is low. The collection of data from only one area without a control comparison does not provide useful information for analysis.

The concept of providing an economic analysis based on scientific trial data is an excellent means of converting scientific results into "farmer friendly" information. This process involves the evaluation of the trial results from a farm management perspective and the translation of the results into costs and returns to farmers. In order for such an evaluation to be the most effective, it is important that there be an element of economic input to the trial design and to the collection of data on the trial results. This will ensure that the information needed for the farm management oriented economic analysis is readily available and can be collected as the trial proceeds.
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FIGURE 1

Summary of Grazing Pattern of Matua

Note
1 Spelling Matua late Jan - early April to build up quality grazing pasture over mating period. Utilise by strip grazing.

2 Spelling Matua to build up pasture reserves for pre-lamb and lambing feed. Utilise by strip grazing.

3 Rotationally graze Matua when it reaches 15-20 cm in height with grazing periods of less than four days.
Figure 2
Dry Matter Production of Nui and Matua Under Canterbury Dryland Conditions

Key
- Nui
- Matua

Kg Dm/day

Jan  Feb  Mar  Apr  May  June  July  Aug  Sep  Oct  Nov  Dec
Dry Matter Availability and Requirement on a 100 ha Nui/Matua Dryland Farm Carrying 120 Ewes

*The total dry matter available in each month includes DM carried forward and DM growth*
FIGURE 4

Dry Matter Availability and Requirement on a 100 ha Nui/Tama/Turnip Dryland Farm Carrying 785 Ewes

Dry Matter Availability and Requirement on a 100 ha Nui/Tama/Turnip Dryland Farm Carrying 785 Ewes
APPENDIX 1

Sheep Gross Margins *

A.1.1. Gross Margin @ 13 ewes/ha

50% Matua, 50% Nui Dryland Pasture

Assumptions:
- No deaths, replacements purchased as 2 teeth
- Lambing 185% survival to sale
- Wool 4 kg/ewe
- Lamb liveweight 25.7 kg
- Carcase Wt 42% of liveweight

Gross Revenue:
- Lamb sales: 24 @ $9.38 225.12
- 10.79 kg @ 133c/kg $14.35
- Wool pull: 0.95 kg @ $4.75
- Charges $9.72
- Wool Sales:
  - 4 kg head @ $3.50/kg net 182.00
  - Ewe sales: 3.25 ewes at $3.00 net 9.75

Total Gross Revenue: $416.87

Direct Costs:
- Replacement: 3.25 2th ewes @ $18.00/hd 58.50
- Drench: ewes twice @ 19.42c/dose 5.05
- Lambs twice @ 7.76c/dose 3.73
- Vaccination: ewes @ 11.79c 1.53
- Eartags, footrot, docking: 50c/ewe 6.50
- Dipping: 34c/ewe 4.42
- Ram cost: 50c/ewe 6.50
- Cartage: 65c/lamb to works 15.60
  - 80c/ewe to works 5.20
- Woolshed expenses: 34c/head 4.42
- Shearing: 13 @ $82.50/100 10.73
- Crutch: 13 @ $36/100 4.68
- Feed Costs:
  - Hay-25.5 kg/ewe @ $.83/bale cost 11.00
  - Barley-8.4 kg/ewe @ $150/t 16.38

Total Direct Costs $154.24

Gross Margin @ 13 ewes/ha $262.63

Gross Margin $/SU 20.20

Note: Additional Revenue from 347 bales surplus hay @ $1.67 net 579.49

* Ref. for Gross Margins in Appendix 1, Department of Farm Management and Rural Valuation, Lincoln College, 1986
A.1.2. **Gross Margin @ 16 ewes/ha**

262.63

50 % Matua 50 % Nui Pasture Dryland

**Assumptions:**
No deaths, replacements purchased as 2 tooth
Lambing: 181% Survival to Sale
Wool: 4 kg/ewe
Lamb Liveweight: 26.8 kg
Carcase Wt: 42 % liveweight

**Gross Revenue:**
Lamb Sales: 29 @ $9.93 287.97
11.26 @ 133c/kg $14.98
Wool pull: 0.95 kg @ $4.75
Charges: $9.80
Wool sale: 4 kg @ $3.50/kg nett 224.00
Ewe sales: 4 ewes @ $3.00/hd 12.00

Total Gross Revenue $523.97

**Direct Costs**

Replacement: 4 2th ewes at $18.00/hd 72.00
Drench: Ewes twice @ 19.42c/dose 6.21
Lambs twice @ 7.76c/dose 4.50
Vacination ewes: @ 11.79c 1.89
Eartags, footrot, docking: 50c/ewe 8.00
Dipping: 34c/ewe 5.44
Ram cost: 50c/ewe 8.00
Cartage: 65c/lamb to works 18.85
80c/ewe 6.40
Woolshed expenses: 34c/head 5.44
Shearing: 16 @ 82.50/100 13.20
Crutch: 16 @ $36/100 5.76
Feed Costs: Hay 25.5 kg/ewe @ $2.50/bale 40.80
Barley 8.4 kg/ewe @ $150/t 20.16

Total Direct Cost $216.65

**Gross Margin @ 16 ewes/ha** 307.32

**Gross Margin $/SU** 19.21
A.1.3. Gross Margin @ 13 Ewes/ha

100% Nui Dryland Pasture

Assumptions: No deaths, replacements purchased as 2 tooths
Lambing: 183% survival to sale
Wool: 4 kg/ewe
Lamb liveweight: 26.0 kg
Carcase Wt: 42% of liveweight

Gross Revenue: Lamb sales: 24 @ $9.52 228.45
10.92 kg @ 133c/kg $14.52
Wool pull: 0.95 kg $4.75
Charges: $9.75
Wool Sales:
4 kg/head @ $3.50/kg nett 182.00
Ewe Sales:
3.25 ewes @ $3.00 net 9.75

Total Gross Revenue $420.20

Direct Costs: Replacement: 3.25 2 tooth ewes @ $18.00/head 58.50
Drench: Ewes twice @ 19.42c/dose 5.05
Lambs twice @ 7.76c/dose 3.73
Vaccination Ewes: @ 11.79c 1.53
Eartags, footrot, docking: 50c/ewe 6.50
Dipping: 34c/ewe 4.42
Ram cost: 50c/ewe 6.50
Cartage: 65c/lamb 15.60
80c/ewe 5.20
Woolshed expenses: 34c/hd 4.42
Shearing: $82.50/100 10.73
Crutching: $36/100 4.68
Feed Costs:
Hay - 25.5 kg/ewe @ $.83/bale cost 11.00
Barley - 8.4 kg/ewe @ $150/t 16.38

Total Direct Costs $154.24

Gross Margin 13 ewes/ha $265.96
Gross Margin $/SU 20.46

Additional Revenue from 300 bales of hay @ $1.67 net $501.00
A.1.4 Gross Margin @ 16 Ewes/ha

100 % Nui Dryland Pasture

Assumptions: No Deaths, replacements purchased as 2 teeth
Lambing: 169% Survival to Sale
Wool: 4 kg/Ewe
Lamb Liveweights: 25.3 kg
Carcase Wt: 42% of Liveweight

Gross Revenue: Lamb Sales: 27 @$9.19
10.63 @ 133c/kg
Woolpull: 0.95kg @ $4.75
Charges: $9.69/hd
Wool Sales:
4 kg/head @ $3.50/kg Nett
Ewe Sales: 4 ewes @ $3.00 net

Total Gross Revenue: $484.13

Direct Costs:
Replacement: 4 2th ewes at $18.00 72.00
Drench: Ewes twice @ 19.42c/dose 6.21
Lambs twice @ 7.76c/dose 4.19
Vaccination: Ewes @ 11.79c 1.89
Eartags, footrot, docking: 50c/ewe 8.00
Dipping: 34c/ewe 5.44
Ram Cost: 50c/ewe 8.00
Cartage: 65c/lamb 17.55
80c/ewe 6.40
Woolshed Expenses: 34c/hd 5.44
Shearing: $82.50/100 ewes 13.20
Crutching: $36/100 ewes 5.76
Feed Costs: Hay 25.5 kg/ewe @ $2.50/bale 40.80
Barley 8.4 kg/ewe @ $150/t 20.16

Total Direct Costs: $215.04

Gross Margin @ 16 ewes/ha $269.09
Gross Margin $/SU 16.82
A.1.5. Gross Margin @ 22 Ewes/ha

30% Matua, 70% Nui Irrigated pasture

Assumptions: No Deaths, replacements purchased as 2 tooths
Lambing 195% Survival to Sale
Wool: 4 kg/1 Ewe
Lamb Liveweights: 31.7 kg
Carcase Wt: 42% of Liveweight

Gross Revenue: Lamb Sales: 43 @ $12.55 538.40
13.31 kg @ 133c/kg
Woolpull: 0.95kg @ $4.75
Charges: $9.90/hd
Wool Sales:
4 kg/head @ $3.50/kg Net 308.00
Ewe Sales: 5.5 @ $3.00 16.50

Total Gross Revenue: $862.90

Direct Costs:
Replacements: 5.5 @ $18.00 99.00
Drench: Ewes twice @ 19.42c/dose 8.54
Lambs twice @ 7.76c/dose 6.66
Vaccination Ewes: @ 11.79c 2.59
Eartags, footrot, docking: 50c/ewe 11.00
Dipping: 34c/ewe 7.48
Ram Cost: 50c/ewe 11.00
Cartage: 65c/lamb 27.89
80c/ewe (works & repl) 8.80
Woolshed Expenses: 34c/hd 7.48
Shearing: 22 @ $82.50/100 ewes 18.15
Crutching: 22 @ $36/100 ewes 7.92

Total Direct Costs: 216.51

Gross Margin/ha @ 22 ewes/ha 646.39
Gross Margin $/SU 29.38
A.1.6. Gross Margin: 20 Ewes and 5 Hoggets/ha

30% Matua, 70% Nui Irrigated pasture

Assumptions:
- No deaths, breed own replacement
- Lambing: 190% Survival to Sale
- Wool: 4 kg per Ewe
- Lamb Liveweights: 30.6 kg
- Carcase Wt: 42% of Liveweight

Gross Revenue:
- Lamb Sales 33 @ $11.94
  12.85 kg @ $1.33/kg
  Woolpull: 0.95kg @ $4.75
  Charges: $9.90/hd
- Wool Sales:
  4 kg/head @ $3.50/kg Nett
- Ewe Sales: 5 @ $3.00

Total Gross Revenue: $759.02

Direct Costs:
- Drench: Ewes twice @ 19.42c/dose
  Lambs twice @ 7.76c/dose
- Replacements six times @ 7.76c/dose
- Vaccination Ewes: @ 11.79c
- Eartags, footrot, docking: 50c/ewe
- Dipping: 34c/animal
- Ram Cost: 50c/ewe
- Cartage: 65c/lamb
  80c/ewe
- Woolshed Expenses: 34c/animal
- Shearing: 25 @ $82.50/100 ewes
- Crutching: 25 @ $36/100 ewes

Total Direct Costs $109.66

Gross Margin @ 20 ewes/ha

Gross Margin $/SU
A.1.7.  **Gross Margin @ 11.2 Ewes/hectare**

30% Matua, 70% Nui Irrigated pasture

**Assumptions:**
- No deaths, replacements purchased as 2 tooths
- Lambing: 120% Survival to Sale
- Wool: 4 kg/Ewe
- Lamb Liveweight: 30.95
- Carcase Wt: 42% of Liveweight

**Gross Revenue:**
- Lamb Sales: 13.4 @ 12.14
- 13.0 kg @ 13.3c/kg
- Woolpull: .95 kg @ $4.75
- Charges: $9.90/hd
- Wool Sales:
  - 4 kg/eq @ $3.50/kg Nett
- Ewe Sales: 2.8 @ $3.00

**Total Gross Revenue:** $327.87

**Direct Costs:**
- Replacement: 2.8 @ 18.00
- Drench: Ewes twice @ 19.42c/dose
- Lambs twice @ 7.76c/dose
- Vaccination Ewes: @ 11.79c
- Eartags, footrot, docking: 50c/ewe
- Dipping: 34c/animal
- Ram Cost: 50c/ewe
- Cartage: 65c/lamb
- 80c/ewe
- Woolshed Expenses: 34c/ewe
- Shearing: 11.2 @ $82.50/100 ewes
- Crutching: 11.2 @ $36/100 ewes

**Total Direct Costs:** $103.43

**Gross Margin @ 11.2 ewes/ha** 224.44

**Gross Margin $/SU** 20.24
A.1.8. Gross Margin @ 7.85 Ewes/hectare

15 % Tama, 15 % Turnips, 70 % Nui

Assumptions: No deaths, replacements purchased as 2 teeth
Lambing: 120% Survival to Sale
Wool: 4 kg/Ewe
Lamb Liveweight: 30.95 kg
Carcase Wt: 42% of Livestock

Gross Revenue: Lamb Sales: 9.42 @ 12.14 114.36
13 kg @ 133c/kg:
Woolpull: .95 kg @ $4.75
Charges: $9.90/hd
Wool Sales:
4 kg/head @ $3.50/kg Nett 109.90
Ewe Sales: 2.0 @ $3.00 6.00

Total Gross Revenue: $230.26

Direct Costs: Replacement P: 2.0 @ 18.00 36.00
Drench: Ewes twice @ 19.42c/dose 3.05
Lambs twice @ 7.76c/dose 1.46
Vaccination Ewes: @ 11.79c 0.93
Eartags, footrot, docking: 50c/ewe 3.93
Dipping: 34c/ewe 2.67
Ram Cost: 50c/ewe 3.93
Cartage: 65c/lamb 7.72
80c/ewe 2.67
Woolshed Expenses: 34c/ewe 2.67
Shearing: 7.85 @ $82.50/100 6.48
Crutching: 7.85 @ $36/100 ewes 2.83

Total Direct Costs 73.27

Gross Margin @ 7.85 ewes/ha 156.99
Gross Margin $/SU 20.00
APPENDIX 2 *

Pasture Establishment and Maintenance Cost

A.2.1. MATUA PRAIRIE GRASS UNDER DRYLAND CONDITIONS FOR GREENFEED.

Programme

Ex drought affected "Nui" Ryegrass pasture, receives two grubblings with lime applied between the grubblings. Cultivation then follows a programme of grub, harrow and roll in sequence, three times to achieve weed control. Cultivation started late spring, early summer with seed broadcast early autumn. Light harrowing and use of cambridge roller to maximise low soil moisture levels after broadcasting.

Direct Costs

Seedbed Preparation:
5.2 hrs/ha @ $15.47/hr = 80.44
Broadcast cost $5/ha = 5.00
Seed: 30 kg/ha at $3.05/kg Matua = 102.00
3 kg/ha W.Clover at $3.50/kg = 10.50
Treatment: 25c/kg = 7.50
Insecticide: Thimet (phorate) 4 kg/ha = 23.20

Establishment Cost per ha = $218.14

Fertiliser:
125 kg/ha Superphosphate at $175/tonne Spread = 21.88

Lime
1 tonne/ha every four years at $13.84/ton delivered
Spreading $3.70/ha = 4.39

Annual Maintenance Cost per ha = $26.27

* Reference for Gross Margins in Appendix 2, Department of Farm Management and Rural Valuation, Lincoln College, 1986.

A.2.2. NUI RYEGRASS UNDER DRYLAND CONDITIONS FOR LIVESTOCK GRAZING

Programme

Ex drought affected Nui Ryegrass pasture receives two grubblings with lime in between the grubblings. Cultivation then follows a programme of grub, harrow and roll in sequence, three times to achieve weed control. Cultivation started late spring/early summer with seed drilled with white clover early autumn.

Direct Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedbed Preparations: 5.2 hours @ $15.47/hr</td>
<td>80.44</td>
</tr>
<tr>
<td>Seed: 20 kg Nui @ $1.50/kg</td>
<td>30.00</td>
</tr>
<tr>
<td>3 kg Huia W. Clover @ $3.50/kg</td>
<td>10.50</td>
</tr>
<tr>
<td>Insecticide: Thimet (phorate) 4 kg/ha</td>
<td>23.20</td>
</tr>
<tr>
<td>Establishment Cost per ha</td>
<td>$144.14</td>
</tr>
</tbody>
</table>

Fertiliser:

- Superphosphate 125 kg/ha @ $175/tonne | 21.88

Lime:

- Every fourth year 1 tonne/ha at 13.84/tonne delivered | 4.39
- Spreading 3.70/ha

Annual Maintenance Cost per Ha | $26.27
A.2.3. NUI RYEGRASS UNDER IRRIGATED CONDITIONS FOR CONSUMPTION BY LIVESTOCK

Programme

Ex irrigated Nui pasture disced twice, late spring then ploughed, heavy harrowed, grubbed and heavy harrowed. Lime applied prior to last grubbing. Drilled and harrowed with Nui/white clover mix early autumn.

Direct Costs per hectare

<table>
<thead>
<tr>
<th>Establishment Costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedbed Preparation:</td>
<td></td>
</tr>
<tr>
<td>11 hrs @ $15.47/hr</td>
<td>170.17</td>
</tr>
<tr>
<td>Seed:</td>
<td></td>
</tr>
<tr>
<td>20 kg Nui at $1.50/kg</td>
<td>30.00</td>
</tr>
<tr>
<td>3 kg Huia W.Clover at $3.5/kg</td>
<td>10.50</td>
</tr>
<tr>
<td>Insecticide:</td>
<td></td>
</tr>
<tr>
<td>Thimet (phorate) 4 kg/ha</td>
<td>23.20</td>
</tr>
<tr>
<td>Establishment Cost per Ha</td>
<td>$233.87</td>
</tr>
</tbody>
</table>

Fertiliser:

150 kg/ha Superphosphate @ $175/tonne 26.25

Lime:

1 tonne/ha every four years @ $13.84/ton delivered $3.70/ha spread 4.39

Water Charge 50.00

Annual Maintenance Cost Per Ha $80.64
A.2.4. MATUA PRAIRIE GRASS UNDER IRRIGATION FOR GREENFEED

Programme

Ex irrigated Nui, pasture disced twice late spring, ploughed, heavy harrowed, grubbed and heavy harrowed. Lime applied prior to grubbing. Broadcast & harrow.

Direct Costs per hectare

Seedbed Preparation:
11 hrs @ $15.47/hr  170.17
Seed: 3 kg W.Clover @ $3.05/kg  10.50
  30 kg Matua @ $3.05/kg  91.50
Fungicide treatment: 25c/kg  7.50
Insecticide:
  Thimet (phorate) 4 kg/ha  23.20

Establishment Cost per ha  $302.87

Fertiliser:
  150 kg/ha Superphosphate at $175/tonne  26.25

Lime:
  1 tonne/ha every four years @ $13.84/ton
    delivered $3.70/ha spread  4.39
    Water Charge:  50.00

Annual Maintenance Cost per ha.  $80.64
A.2.5. TAMA RYEGRASS FOR GREENFEED UNDER DRYLAND CONDITIONS

Programme

Ex drought affected Nui ryegrass pasture. Ploughed early summer, grub and harrow twice with lime application in between. Roll and harrow then drill early February. Nitrogen application late Autumn.

Direct Costs

Seedbed Preparation:
5.9 hrs/ha @ $15.47/hr

Seed:
30 kg/ha @ $1.30/kg

Insecticide:
Thimet (phorate) 4 kg/ha

Fertiliser:
125 kg/ha Superphosphate @ $175/tonne

Lime:
1 tonne/ha every four years @ $13.84/ton
delivered $3.70/ha spread

Nitrogen 250 kg/ha Sulphate of Ammonia
at $280/tonne

Total Annual Costs per ha
$249.74
A.2.6. SOFT TURNIPS FOR GREENFEED UNDER DRYLAND CONDITIONS

Programme

Ex drought affected Nui Ryegrass pasture. Ploughed spring to conserve moisture and grubbed and harrowed. Lime application January, and then grubbed and harrowed again. Rolled and harrowed before drilling in early February.

Direct Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Cost per Unit</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedbed Preparation:</td>
<td>5.6 hrs/ha</td>
<td>@ $15.47/hr</td>
<td>$86.63</td>
</tr>
<tr>
<td>Seed:</td>
<td>800 gms/ha</td>
<td>@ $4.50/kg</td>
<td>$3.60</td>
</tr>
<tr>
<td>Insecticide:</td>
<td></td>
<td></td>
<td>$23.20</td>
</tr>
<tr>
<td>Thimet (phorate) 4 kg/ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertiliser:</td>
<td></td>
<td></td>
<td>$21.88</td>
</tr>
<tr>
<td>125kg/ha Superphosphate @ $175/ton</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lime</td>
<td></td>
<td></td>
<td>$4.39</td>
</tr>
<tr>
<td>1 tonne/ha every four years @ $13.84/ton delivered $3.70/ha spread</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Annual Costs per ha $139.70
APPENDIX 3

PRODUCTION DATA FROM DSIR TRIALS

A.3.1. Dryland Trials

Table A.3.1.

Seasonal Intake of Pasture by Sheep Grazing Nui and Nui & Matua Systems
(tonnes DM/ha)

<table>
<thead>
<tr>
<th>Stocking Rate</th>
<th>Cultivar</th>
<th>Proportion</th>
<th>Autumn</th>
<th>Winter</th>
<th>Early Spring</th>
<th>Lactation</th>
<th>Summer</th>
<th>Hay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nui/</td>
<td>Matua</td>
<td>Nui/</td>
<td>Nui/</td>
<td>Nui/</td>
<td>Nui/</td>
<td>Nui/</td>
<td>Nui</td>
</tr>
<tr>
<td></td>
<td>13 ewes</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>16 ewes</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Autumn</td>
<td>0.8</td>
<td>1.3</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>1.3</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Winter</td>
<td>0.5</td>
<td>0.6</td>
<td>0.2</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Early Spring²</td>
<td>-</td>
<td>0.6</td>
<td>0.2</td>
<td>0.5</td>
<td>-</td>
<td>0.6</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Lactation</td>
<td>1.5</td>
<td>2.1</td>
<td>1.4</td>
<td>2.0</td>
<td>1.7</td>
<td>2.1</td>
<td>1.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Summer</td>
<td>2.0</td>
<td>1.1</td>
<td>1.8</td>
<td>1.1</td>
<td>2.0</td>
<td>0.9</td>
<td>1.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Hay</td>
<td>0.8</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.7</td>
<td>0.5</td>
<td>0.3</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Total System Yield 11.2 10.2 11.2 9.9

Annual Yield 11.2 11.1 10.7 9.7 11.5 10.9 10.3 9.4

1 Winter spelled; 40% of area ploughed in December for renewal
2 1 August - 5 December

Source: Fraser, T.J., 1985

---

Table A.3.1.2.

Animal Performance on Dryland Pastures

<table>
<thead>
<tr>
<th>Ewes</th>
<th>Nui/Matua</th>
<th>Nui</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking Rate</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Ewes Liveweight start (kg)</td>
<td>60.5 (1.6)</td>
<td>58.9 (1.0)</td>
</tr>
<tr>
<td>Ewes Liveweight start (kg)</td>
<td>61.2 (1.2)</td>
<td>60.5 (1.1)</td>
</tr>
<tr>
<td>Lambs</td>
<td>Survival to sale %</td>
<td>185</td>
</tr>
<tr>
<td>Mean liveweight (kg)</td>
<td>25.7 (0.8)</td>
<td>26.8 (0.7)</td>
</tr>
<tr>
<td>Calculated meat yield kg/ha</td>
<td>297</td>
<td>375</td>
</tr>
</tbody>
</table>

Source: Fraser, T.J., 1984

Standard deviations in bracket
### A.3.2. Irrigated Trials

#### Table A.3.2.1.

**Seasonal Intake of Pasture**  
(totnes DM/ha)

<table>
<thead>
<tr>
<th>Year</th>
<th>1980/81</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking Rate</td>
<td>22 Ewes</td>
</tr>
<tr>
<td>Cultivar/Management</td>
<td>Nui Matua</td>
</tr>
<tr>
<td>Proportion</td>
<td>70 30</td>
</tr>
<tr>
<td>Autumn</td>
<td>2.09 1.35</td>
</tr>
<tr>
<td>Winter</td>
<td>1.56 0.60</td>
</tr>
<tr>
<td>Spring</td>
<td>3.23 1.67</td>
</tr>
<tr>
<td>Summer</td>
<td>2.56 1.05</td>
</tr>
<tr>
<td>Total System Yield</td>
<td>14.11</td>
</tr>
<tr>
<td>Annual Yield</td>
<td>13.49 15.57</td>
</tr>
</tbody>
</table>

Source: Fraser, T.J., 1985

#### Table A.3.2.2.

**Seasonal Intake of Pasture**  
(totnes DM/ha)

<table>
<thead>
<tr>
<th>Year</th>
<th>1981/82</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking Rate</td>
<td>20 ewes + 5 hghts</td>
</tr>
<tr>
<td>Cultivar</td>
<td>Nui Matua</td>
</tr>
<tr>
<td>Proportion</td>
<td>70 30</td>
</tr>
<tr>
<td>Autumn</td>
<td>1.38 1.2</td>
</tr>
<tr>
<td>Winter</td>
<td>1.58 0.5</td>
</tr>
<tr>
<td>Early Spring</td>
<td>0.01 0.7</td>
</tr>
<tr>
<td>Lactation</td>
<td>3.95 1.3</td>
</tr>
<tr>
<td>Summer</td>
<td>2.7 1.9</td>
</tr>
<tr>
<td>Total System Yield</td>
<td>15.22</td>
</tr>
<tr>
<td>Annual Yield</td>
<td>13.74 18.67</td>
</tr>
</tbody>
</table>

Source: Fraser, T.J. pers comm
Table A.3.2.2.
Animal Performance on Irrigated Pasture

<table>
<thead>
<tr>
<th>Year Cultivar</th>
<th>1980/81 Nui/Matua</th>
<th>1981/82 Nui/Matua</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stocking rate</td>
<td>22 (+5 hoggets)</td>
<td></td>
</tr>
<tr>
<td>Ewes start (kg)</td>
<td>63.7 (0.9)</td>
<td>66.3 (1.2)</td>
</tr>
<tr>
<td>Ewes end (kg)</td>
<td>66.7 (1.1)</td>
<td>64.8 (1.1)</td>
</tr>
<tr>
<td>Lambs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Survival to Sale %</td>
<td>195</td>
<td>190</td>
</tr>
<tr>
<td>Mean Liveweight (kg)</td>
<td>early Dec</td>
<td>24 (0.4)</td>
</tr>
<tr>
<td>Mean liveweight (kg)</td>
<td>early Feb</td>
<td>31.7 (0.5)</td>
</tr>
</tbody>
</table>

Standard deviations in brackets
APPENDIX 4

FEED BUDGETS

A.4.1. 100 ha dryland farm with 70% of area in Nui-based pastures and 30% of area in Matua-based pastures. Both pastures last for five years. Grazing regime is as described in text Section 4. A wastage factor of 10% per month is applied to dry matter carried forward on the paddock. Conserved dry matter carried forward sustains a once-only loss of 30%.

<table>
<thead>
<tr>
<th></th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter Grown and</td>
<td>32984</td>
<td>51546</td>
<td>64570</td>
<td>15120</td>
<td>8680</td>
<td>67813</td>
<td>102960</td>
<td>168284</td>
<td>106560</td>
<td>76632</td>
<td>53320</td>
<td>25088</td>
</tr>
<tr>
<td>available for grazing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed brought forward</td>
<td>100000</td>
<td>92198</td>
<td>86762</td>
<td>93591</td>
<td>70352</td>
<td>43641</td>
<td>57701</td>
<td>89891</td>
<td>171654</td>
<td>170572</td>
<td>154155</td>
<td>133066</td>
</tr>
<tr>
<td>Monthly demand of</td>
<td>30542</td>
<td>47342</td>
<td>30542</td>
<td>47342</td>
<td>60782</td>
<td>60782</td>
<td>91022</td>
<td>78254</td>
<td>61958</td>
<td>61958</td>
<td>49022</td>
<td></td>
</tr>
<tr>
<td>1120 ewes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surplus</td>
<td>102442</td>
<td>96402</td>
<td>103990</td>
<td>78169</td>
<td>48490</td>
<td>64112</td>
<td>99879</td>
<td>97393</td>
<td>87192</td>
<td>168951</td>
<td>145517</td>
<td>109132</td>
</tr>
<tr>
<td>Dry matter carried</td>
<td>92198</td>
<td>86762</td>
<td>93591</td>
<td>70352</td>
<td>43641</td>
<td>57701</td>
<td>89891</td>
<td>50654</td>
<td>149572</td>
<td>133155</td>
<td>112066</td>
<td>79319</td>
</tr>
<tr>
<td>forward on paddock</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Conserved DM carried</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>forward</td>
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<tr>
<td></td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100319</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
A.4.2. 100 ha dryland farm with 70% of area in Nui-based pastures, 15% of the area in soft turnips and 15% of the area in Tamar ryegrass. Grazing regime is as described in text Section 4. A wastage factor of 10% per month is applied to dry matter carried forward on the paddock conserved. Dry matter carried forward sustains a once-only loss of 30%.

<table>
<thead>
<tr>
<th></th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter Grown and available for grazing</td>
<td>32984</td>
<td>30240</td>
<td>47047</td>
<td>36120</td>
<td>47383</td>
<td>33015</td>
<td>66360</td>
<td>135366</td>
<td>65520</td>
<td>46872</td>
<td>31248</td>
<td>25088</td>
</tr>
<tr>
<td>Seed brought forward</td>
<td>100000</td>
<td>100419</td>
<td>87730</td>
<td>91435</td>
<td>95533</td>
<td>109358</td>
<td>98272</td>
<td>109827</td>
<td>176332</td>
<td>162350</td>
<td>141036</td>
<td>118072</td>
</tr>
<tr>
<td>Monthly demand of 1120 ewes</td>
<td>21407</td>
<td>33182</td>
<td>33182</td>
<td>21407</td>
<td>21407</td>
<td>33182</td>
<td>42602</td>
<td>42602</td>
<td>63797</td>
<td>54848</td>
<td>43426</td>
<td>34359</td>
</tr>
<tr>
<td>Surplus</td>
<td>111577</td>
<td>97477</td>
<td>101595</td>
<td>106148</td>
<td>121509</td>
<td>109191</td>
<td>122030</td>
<td>202591</td>
<td>178055</td>
<td>154373</td>
<td>128858</td>
<td>108801</td>
</tr>
<tr>
<td>Dry matter carried forward on paddock</td>
<td>100419</td>
<td>87730</td>
<td>91435</td>
<td>95533</td>
<td>109358</td>
<td>98272</td>
<td>109827</td>
<td>155332</td>
<td>141350</td>
<td>120036</td>
<td>97072</td>
<td>79021</td>
</tr>
<tr>
<td>Dry matter carried forward</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
<td>21000</td>
</tr>
<tr>
<td>Total</td>
<td>100021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Between March 1984 and November 1985, the Ministry of Agriculture and Fisheries staff at Lincoln, in conjunction with a local farmer, Mr. Alex Dunlop, conducted an on-farm trial comparing a 70 per cent Matua and white clover 30% Nui and white clover unit with a 100 per cent Nui and white clover unit. Each unit comprised eight hectares. On the 100 per cent Nui unit three hectares were sown in high endophyte ryegrass and five hectares in low endophyte ryegrass. Both units were located on Lismore stony silt loam.

Unfortunately, on two occasions during the trial, adjustments were made which have reduced the validity of the comparison and it was necessary to finish the demonstration before several season's unbiased data could be collected. From April 7 to May 2, 1984, the ewes from the Nui farmlet were shifted to the Matua farmlet. This was intended to compensate for the fact that the Matua block had more dry matter per hectare at the start of the trial. A more appropriate adjustment would have been the equalisation of dry matter by grazing or topping before the trial commenced. The measure adopted resulted in an overcompensation and the proportion attributed to the Matua unit is therefore understated.

Secondly, after lambing, dry ewes and ewes which had had bearing or had aborted were culled. The lambing percentage of ewes with live lambs was calculated for each unit. Ewe numbers were brought up to the original levels and the calculated lambing percentage maintained by buying ewes and lambs 'all-counted'.

The timing of the trial has also led to an understatement of the benefits of Matua, since the first season's lambing percentage and the largest portion of its wool production had actually been determined by levels of feeding in the months before the trial.

The costs and returns from each farmlet over the twenty one month period for which the demonstration was conducted are summarised below. Pasture establishment costs, which were not incurred during this period will be discussed later.
Table A.5.1.
Costs and Returns from MAF Grazing Trial

<table>
<thead>
<tr>
<th>Nui/Matua</th>
<th>Nui</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returns (March 1984 - March 1985)</td>
<td>$</td>
</tr>
<tr>
<td><strong>Lamb:</strong> 122 @ 14.5 kg = $13.87/ha</td>
<td>1692.14</td>
</tr>
<tr>
<td><strong>Cull Ewes:</strong> 21 @ $3.00/ha</td>
<td>63.00</td>
</tr>
<tr>
<td><strong>Wool:</strong> 247.8 kg @ $3.50/kg net</td>
<td>867.30</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td>2622.44</td>
</tr>
</tbody>
</table>

April '85 - November '85

| **Lamb:** 148 @ 10.64 kg = $8.35/ha | 1235.80 | 125 @ 11.28 kg = $9.13/ha | 1141.25 |
| **Cull Ewes:** 19 @ $300/ha | 57.00 | | 48.00 |
| **M.A. Ewes:** 77 @ $14.00 | 1078.00 | | 896.00 |
| **Wool:** 337.4 kg @ $3.50/kg net | 1180.90 | | 1047.20 |
| **Sub-total** | 3551.70 | | 3132.45 |
| **Total Returns** | 6174.14 | | 5755.73 |

Direct Sheep Costs (March '84 - March '85)

**Stock Purchase:**

| 3/84 80 M.A. Ewes @ $14.00/ha | 1120.00 | 80 | 1120.00 |
| 8/84 9 M.A. Ewes & 13 lambs A.C. @ $7.00 | 154.00 | 12 ewes plus 19 lambs | 217.00 |
| 2/85 32 Ewes 16 M.A. @ $14.00 16 2 th @ $18.00 | 224.00 | 23 / M.A. 16 2 th | 288.00 |

**Drenching:**

- Ewes 80 - Se only @ 3.0c | 2.40 | 80 | 2.40 |
- 2 x 8 Nilverplus Se @ $22.42 35.87 | 2 x 80 | 35.87 |
- Lambs 2 x 122 " @ 10.76 26.87 | 2 x 136 | 29.27 |
- 2 x 61 " @ 10.76 13.13 | 2 x 68 | 14.63 |
- Eartags: 121 @ 18c 21.78 | 136 | 24.48 |
- Docking: 122 @ 3.15 c 3.84 | 136 | 4.28 |
- Dipping: 64 @ 34 c 21.76 | 65 | 22.10 |
- Shearing: 80 @ 32.5 c 66.00 | 80 | 66.00 |
- Crutch: 80 @ 36c 28.80 | 80 | 28.80 |
- Woolshed Exp: 80 @ 34c 27.20 | 80 | 27.20 |

Table A.5.1 cont'd ...
Table A.5.1 cont'd

<table>
<thead>
<tr>
<th>Transport:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inward:</td>
<td>Ewes 112 @ 84c</td>
<td>94.00</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>Ewes &amp; Lambs 9 @ $1.00</td>
<td>9.00</td>
<td>12</td>
</tr>
<tr>
<td>Outward:</td>
<td>Ewes 21 @ 84c</td>
<td>17.64</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Lambs 122 @ 60c</td>
<td>73.20</td>
<td>130</td>
</tr>
<tr>
<td>Sub-total</td>
<td>2226.95</td>
<td></td>
<td>2173.87</td>
</tr>
</tbody>
</table>

Direct Sheep Costs Mar 1985 - Nov 1985

Drenching:
- Ewes: 96 - Se only @ 3.0 c
  - 2 x 96 Nilverm + Se @ 22.42
  - Lambs: 1 x 148 " " @ 10.76
- Docking: 148 @ 3.15
- Shearing: 96 @ 82.5c
- Woolshed Exp: 96 @ 34c

Transport:
- Outward: 96 Ewes @ 84c
  - 148 Lambs @ 60c

<table>
<thead>
<tr>
<th></th>
<th>Direct Sheep Costs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drenching:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ewes: 96 - Se only @ 3.0 c</td>
<td>2.88</td>
<td>80</td>
</tr>
<tr>
<td>2 x 96 Nilverm + Se @ 22.42</td>
<td>43.05</td>
<td>2 x 8</td>
</tr>
<tr>
<td>Lambs: 1 x 148 &quot; &quot; @ 10.76</td>
<td>15.92</td>
<td>1 x 125</td>
</tr>
<tr>
<td>Docking: 148 @ 3.15</td>
<td>4.66</td>
<td>125</td>
</tr>
<tr>
<td>Shearing: 96 @ 82.5c</td>
<td>79.20</td>
<td>80</td>
</tr>
<tr>
<td>Woolshed Exp: 96 @ 34c</td>
<td>32.64</td>
<td>80</td>
</tr>
<tr>
<td>Sub-total</td>
<td>347.79</td>
<td>291.06</td>
</tr>
</tbody>
</table>

Total Direct Sheep Costs | 2574.74 | 2474.93 |

Pasture Maintenance Costs March 1984 - March 1985

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>125 kg/ha S.Super Extra @ 255.36/t applied</td>
<td>255.36</td>
<td>125 kg/ha S.Super</td>
<td>255.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 t silage @ $12.00/t</td>
<td>96.00</td>
<td>per t applied</td>
<td>243.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td>351.36</td>
<td>8 t Silage @ $12.00/t</td>
<td>96.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sub-total | 594.54 |

March 1985 - November 1985

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Overdrilled 2 ha @ 15 kg/ha Nui plus 5 kg/ha Moata</td>
<td>165.50</td>
<td>Overdrilled 2 ha</td>
<td>165.50</td>
</tr>
<tr>
<td>250 kg/ha of N.Super @ $243.45/tonne applied over 2 ha</td>
<td>121.73</td>
<td>250 kg/ha N.Super</td>
<td>121.73</td>
</tr>
<tr>
<td>Sub-total</td>
<td>287.23</td>
<td></td>
<td>287.23</td>
</tr>
</tbody>
</table>

Total Pasture Maintenance Cost | 638.59 | 881.77 |

Total Variable Cost | 3213.33 | 3346.76 |

Net Revenue from Trial Farmlet

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>March 1984 - Nov 1985</td>
<td>2960.81</td>
</tr>
</tbody>
</table>
For the period of the trial the net revenue from the Nui/Matua farmlet exceeded that of the Nui farmlet by $551.78 or $68.97 per hectare. No maintenance fertiliser was applied to either farmlet in the second season as soil tests indicated that nutrient levels were adequate.

The trial did not continue for long enough to determine the pasture life on either farmlet.

The pasture establishment costs of both farmlets in $1986 are detailed in Table A.5.2.

Table A.5.2.
Pasture Establishment Costs

<table>
<thead>
<tr>
<th></th>
<th>Nui/White Clover Farmlet</th>
<th>Matua/White Clover Farmlet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cultivation - variety of machinery passes</td>
<td>69.62</td>
<td>69.62</td>
</tr>
<tr>
<td>eg. several grubbings followed by series of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>harrowings and rollings 4.5 hrs/ha @ $15.47/hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Seed 22 kg Nui Ryegrass @ $1.50</td>
<td>33.00</td>
<td>122.00</td>
</tr>
<tr>
<td>3 kg White Clover @ $3.00</td>
<td>10.50</td>
<td>10.50</td>
</tr>
<tr>
<td>3. Fertiliser 180 kg/ha Super @ $175/t bagged</td>
<td>31.50</td>
<td>31.50</td>
</tr>
<tr>
<td>4. Lime 2.5 Tonne/ha @ $17.54</td>
<td>43.85</td>
<td>43.85</td>
</tr>
<tr>
<td>5. Drilling - own gear and labour 1.2 hrs @ $15.47</td>
<td>18.56</td>
<td>18.56</td>
</tr>
<tr>
<td></td>
<td>207.03</td>
<td>306.03</td>
</tr>
</tbody>
</table>

If a sward-life of five years is assumed, 1.6 hectares of each farmlet would require renewal each season. The costs of the Matua/Nui farmlet would increase by $979.29 and those of the Nui farmlet by $726.49 during the two seasons of the trial. Thus the Matua/Nui farmlet would return $298.98 in total or $37.37 per hectare more than the Nui farmlet, despite the issues of stock transfer and timing which will have led to an underestimation of the advantages of Matua.
DISCUSSION PAPERS


97. Papers Presented at the Tenth Annual Conference of the New Zealand Branch, Australian Agricultural Economics Society, 1986.


99. Farm Structure Change in New Zealand and Implications for Policy, J.R. Fairweather, 1986.

100. Accounting Developments and Implications for Farm Business, R.H. Juchau, 1986.


