CEREALS AND BRASSICAS CAN COMPLEMENT NORTH ISLAND PASTURE PRODUCTION

HARVEY C. SMITH

Director, Crop Research Division, D.S.I.R., Lincoln

Introduction

CROPPING appears to have fallen out of favour in the North Island and the time is overdue for a renewed interest in it. The reason for the decline in popularity of crops is largely that of the emphasis in New Zealand on complete grassland farming. Grassland farming has been the ultimate ideal — the aim for most stock farmers and the main theme of many agricultural advisers and researchers. The reasons for the decline in cropping and for the increased reliance on grassland husbandry are many and it is well worth while re-examining them to see how valid they are today.

Reasons for the Decline in Cropping

(1) More effective transport of grain between 1850 and 1930 from Canterbury and Australia — where grain could be produced regularly, reliably and cheaply.

(2) The high labour requirement for cropping in the past, *e.g.*, for stooking, carting, threshing, for grain, and hand-weeding and feeding-out of root crops.

Reasons for Increased Reliance on Grassland Farming

(1) Because of better types of pasture plants.

(2) Better fertilization and management have given higher production.

(3) Better stock management has related stock requirements more effectively with pasture production.

What factors have changed so that a new look at the value of cropping is required? First, the labour requirement of cropping has vastly declined through increased farm mechanization. Secondly, transport costs have increased since the 1930s and the population has shifted north giving a very high demand for grain in the North Island. Thirdly, improved varieties of crop plants have been developed to give much higher yields now than formerly and an expanded programme of crop research in the North Island is under

way. Fourthly, there is an increasing demand for high quality concentrate feed stuffs which can be readily stored or used when pasture production is low. The modern increasing demand for poultry products, pigmeat and beef is leading to a high all-season feed requirement which will in the future be supplied from crops to an increasing degree.

Crops Suited to North Island Production

The main cereal and brassica crops best suited for increasing agricultural production in the North Island might now be examined:

Cereals

The two main uses of cereal crops are for grain or for green-feed. Usually single purpose crops are grown but occasionally one crop can supply green-feed early and grain later, *e.g.*, early-autumn sown wheat or oats can be grazed in the winter until mid-September as green-feed and can then be left to be harvested in January for grain.

With more intensive production typical of North Island fat lamb or dairy farms, however, the dual purpose crop is unlikely to be very successful because over-grazing or pugging can cause very poor grain yields. Alternatively, when a feed surplus occurs, the lack of grazing of early-sown cereals can provide carry-over sources of diseases and poor yields of grain. For these reasons, single purpose cereal crops are recommended for the North Island.

Grain Crops

There has been a gradual decline in wheat acreage in North Auckland, Auckland, Gisborne and Taranaki from a total of 17,000 acres in 1889 to about 100 acres at present. In Hawke's Bay and Wellington, there was a decline from 20,000 acres in 1899 to 3,000 acres in 1929, but subsequently there has been a gradual increase in acreage to nearly 13,000 in 1962–3. It is not likely that there will be any great increase in grain production in the Auckland, Gisborne and Taranaki districts but recent surveys of potential land and the possible production from improved varieties indicate that a large increase in grain production is possible in the southern half of the North Island. For wheat alone, it has been estimated that in the Wanganui, Manawatu, Wairarapa, and Hawke's Bay areas there is a potential area of about 500,000 acres. This could give a maximum annual area of 100,000 acres in wheat. From a comparison of

climate and grassland (or stock) production records between the south of the North Island and Southland, it appears reasonable to expect each should have a similar potential yielding power for grain crops. The actual wheat yields, however, show quite clearly that year by year there is a large average difference of 20 bushels per acre in favour of Southland. This difference is not due solely to any one factor, although some are clearly much more important than others. From personal experience in both areas, the writer would list the main reasons for the difference (in order of importance) as follows:

(1) Adaptation of varieties — to light, moisture and disease.
(2) Farm management by the individual farmer.
(3) Inaccuracies in the available statistics. The average yields in the North Island surely cannot be as low as they appear.

What is the value of wheat as a grain crop under present or under potential yields and how can such yields be obtained? Under the present average yield of about 40 bushels per acre in the North Island (about 5 bushels per acre below the national average), wheat is clearly *no more* profitable than an efficient return from fat lamb farming. With a potential average yield of 50 to 70 bushels per acre, however, the net return per acre rises from about £24 to between £30 and £40 per acre and is much more profitable than alternative sheep farming products.

The attainment of the potential grain yield for cereals in the North Island depends on the two following factors:

(1) The choice of the best variety in terms of adaptation to the climate and possible diseases, the millers' requirements, and suitability for direct harvesting.
(2) The knowledge and ability of the farmer to provide the cultivation, fertilizer and suitable soil conditions for maximum growth.

At present, the choice of varieties depends to a large degree on when the wheat can be sown and also on what major diseases are expected. In general terms there are two groups of varieties:

(a) New Zealand var. — Aotea and Hilgendorf 61 which must be sown before the middle of September.
(b) Australian var. — Gamenya, Mendos and Gabo which can be sown up to mid-October.

The other main factor determining the choice of variety is the likelihood of disease, in particular stem-rust. Stem-rust is not a new disease. It has been recorded as a serious disease in North Island wheat crops in the Auckland, Taranaki, and Wellington provinces since the 1880s. It is a disease typical of spring-sown wheat crops growing in districts with summer rainfall or heavy summer dews. It was particularly severe in the Waikato in 1958–60 when several large trials were put down there to test the suitability of dairy land for cropping. Stem-rust caused the rapid abandonment of that project. However, it is never a very serious disease in Canterbury, the main wheat-growing area of New Zealand, largely because the crops are autumn-sown and mature before the rust becomes epidemic, and because the summers are typically dry and discourage rust infection.

Because of the danger of rust disease on the west coast districts of the North Island, none of the present Australian or New Zealand varieties are completely suited for obtaining the best average yield for the North Island. It is estimated that the best wheat yields would be obtained from the following alternatives:

(1) Aotea sown from May to August.

(2) Hilgendorf 61 sown in August, September.

(3) Gamenya or Mendos sown September, October.

The acreage of barley in the North Island has increased over the past ten years, owing largely to the increased demand for stock food. Carlsberg, the main variety, has given high yields even though crops are often badly affected by Barley Yellow Dwarf Virus. A new breeding project aimed at increasing the virus resistance of Carlsberg and producing new feed grain varieties has been commenced at Lincoln and will continue in the Manawatu.

What of the Future?

Both in Australia and in New Zealand, plant breeders are developing new varieties better suited to growing in North Island conditions. A new substation of the Crop Research Division will be started soon in the Manawatu and its task will be to continue this breeding project for new wheats for high-yield and baking quality, as well as other projects on new cereals for grain and green-feed and new brassica crops for lamb fattening and winter feed.

GREEN-FEED CROPS

Cereals have been carefully evaluated for supplementary feed production in many trials. In recent years, the technique of overdrilling cereals into pasture has found favour particularly since the reports of Cross and Schwass (1958) and Davies (1959, 1960). Whatman and Allo (1962) point out that the area of green-feed sown depends largely on the rainfall in the previous summer and autumn. There are large increases after dry periods. They emphasize also the suitability of cereals for providing feed for any particular requirement at different seasons, *e.g.*, summer-autumn feed for dairy stock, winter feed for sheep, and spring feed for sheep or dairy stock.

The main advantage of overdrilling cereals occurs in clover-dominant pastures where there is high fertility and both cereals and grasses can be introduced with the dual purpose of providing green-feed for autumn and winter production and renovating the pasture with grass to provide continued spring and summer growth. The other main advantage over straight green-feed crops is that the overdrilled green-feed crop can be fed without danger of poaching in wet weather.

What cereals are readily available and suitable for green-feed crops? The poor availability and high cost of cereal seed in many North Island districts is probably another main factor limiting cereal green-feed in these areas. Increased areas of grain crops in the North Island will be valuable in reducing the cost of seed for green-feed crops and in making seed more readily available.

Research on the efficiency of utilization of green-feed crops and on the value of sowing associated legumes such as red clover and lupins has been carried out at Lincoln previously but has lapsed for the past seven years. This research will start again next year and it is hoped that a programme of breeding new cereals with higher productivity as green-feed crops will be possible.

At present, the most suitable green-feed cereals are not necessarily those most readily available. The variety or type which will be the most productive depends on the season when it is required, the management it will receive, and the duration of feeding required.

Carlsberg barley gives rapid growth but can be fed-off only over a short period and will not regrow readily.

Mapua or Algerian oats will give quick growth, can be fed-off over a long period, are reasonably frost hardy in winter and can be grazed several times.

Aotea or Arawa wheat gives reasonably fast growth, and can be fed-off over a long period, has good frost resistance and can be grazed many times.

C.R.D. ryecorn grows slowly, has very good frost resistance and may be fed-off many times.

In many trials where the total production is measured over a long period, ryecorn shows up best, but the difficulty of obtaining seed and fast growth requirements for intensive farming limits its use to the South Island particularly in inland areas subject to severe winter conditions.

Present-day costs for green-feed are about £2 per acre for seed, but with the rise in cereal grain cropping in the North Island this cost will probably be reduced to about 20s. an acre for barley, and to about 34s. an acre for wheat. This is obviously a high cost relative to brassica seed which, although usually requiring more seedbed preparation, costs only between 5s. an acre for turnips and swedes and about 10s. an acre for choumoellier.

Brassicas

New varieties of rape, turnips, swedes, kale and choumoellier have been or are being developed by the Crop Research Division, D.S.I.R., at Lincoln. When grown with modern labour-saving machinery and using the latest weed control chemicals these new varieties have a valuable place in increasing stock production in the North Island. The main reasons for the decline in brassica cropping in the North Island — high labour requirement and low or unreliable yields — have now been overcome and a renewed study of the best means of their use in the North Island is warranted.

Rape

A new variety already released called "Aphid Resistant Rape" has overcome the major cause of poor production on the low rainfall east coast areas of New Zealand. Further new selections resistant to aphids, virus diseases and clubroot fungus are ready for final testing and release next year. This new rape has been an outstanding success in Australia and the Argentine. Rape has not been very successful when overdrilled into pasture either with or without chemical ploughing treatments, and the high costs of cultivation at present have restricted its use to areas where pasture renewal is regularly required or where other crops can also be profitably grown. Its main advantages are the low cost

of seed, the reliable cropping power and its very fast growth for summer and autumn feeding.

TURNIPS

Soft turnips have been a very valuable supplementary summer or winter feeding crop particularly on low fertility land. The only trouble experienced, particularly in the South Island, has been rotting during the autumn or winter owing to virus disease or club-root.

A new variety, "Kapai 66", will be released if required next February and this has a very high field resistance to mosaic virus diseases. Other varieties with club-root resistance are available and it is anticipated that within a few years new varieties with combined mosaic and club-root resistance will be available. The big advantages of this crop are the low seed cost, rapid growth, high production under all soil conditions and suitability for sowing with pasture or grass mixtures.

SWEDES

The newer swede varieties, Wye, Sensation, and Doon Major, have very good disease resistance to club-root, aphids and mosaic, and dry-rot respectively, as well as having a very high productive capacity. Newer selections with combined disease resistance and high production are at present being developed and should also prove very suitable for the more fertile areas in the North Island when full mechanization, with ridging and weed control techniques, are readily available. All the above brassica crops have the advantage of being readily fed-off in the field even during wet weather.

CHOUMOELLIER

This is probably the most popular brassica crop in the North Island at present. The main advantages are in its reliability, owing to disease resistance (to aphid, mosaic, club-root and dry-rot), its high production, its standing ability. Its main disadvantage, however, is in its high fibre content and high wastage when fed *in situ*. To some extent, this loss can be reduced by cutting and feeding-out on pasture but this involves more labour and mechanical equipment.

A better utilization potential, however, is being obtained by plant breeding. Plants with less fibre and higher digestibility and nutrients are being selected and progeny-tested

as the basis for new varieties to be released by the Crop Research Division in the future.

Summary

Cereal grain crops have a large potential for increased production in the south of the North Island and will aid pasture renewal. Cereal green-feed and brassica forage crops will become more productive as the newer varieties and better cereal seed become available. A new programme of breeding new cereals and brassica crops for the North Island has been commenced by the Crop Research Division of the D.S.I.R. at Lincoln and should assist agricultural production.

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DISCUSSION

When can one expect a wheat for the North Island that can be sown in September and be rust resistant?

A new rust resistant wheat bred in New Zealand and suitable for North Island conditions could be available in four years at the earliest. This particular breeding programme has been going for four years and will be expanded next year.

Do you consider nitrogen applications would boost North Island wheat yields?

Only a minority of wheat crops, namely, those sown after a previous cereal crop, would have increased yield after nitrogen fertilizer application. In nine years of trials, 3 cwt of nitrogen fertilizer decreased yields of wheat following grass, lucerne, and brassicas.

Do you think brassicas could be used profitably on the highest-producing farms that at present use an "all grass" farming system?

Brassicas are widely adapted for cropping throughout New Zealand, and, because they produce about the same dry matter as grass, and all of this is available for one grazing with low wastage, I would think they have a definite place on high-production farms.

Is there any economic spray available that can be used against rust in cereals?

Dithane S31 spray has given economic control in very few trials because the timing of application is difficult to judge and the net return small because complete control is not possible.