YIELD AND HARVEST DATE PROSPECTS FOR SUGAR BEET IN NORTHLAND

G.J. Piggot[1], C.A. Farrell[2] and H.M. Morgan[3]
Agricultural Research Division, Ministry of Agriculture and Fisheries,
Whangarei[1], Kumeu[2] and Dargaville[3]

ABSTRACT

Sugar beet was sown in small blocks on three soils in Northland in October 1980 and subsequently harvested over the period from February to June 1981. Stand establishment and weed control were the main cultural problems. Bulb and sugar yield increased at progressive harvest dates but not as markedly as elsewhere in New Zealand. A yield expectation by late autumn for Northland was assessed to be 12 t sugar/ha, which is not dissimilar to southern regions.

Additional Keywords: small plot evaluation, sugar yield, energy farming, forage crop

INTRODUCTION

Recent publicity surrounding the beet-to-ethanol energy farming concept (NZERDC, 1979) highlighted the limited national data on sugar beet yields. No documented yield and cultural information was available from Northland. Sugar and fodder beet yields achieved by us in South Auckland (Piggot and Farrell, 1980), and farmer interest in energy farming arising from diesel rationing in 1979 suggested that an investigation of the prospects for sugar beet in Northland would be justified. Historically, beet had been grown on a minor scale as a stock feed but lack of yield data also hindered farmer consideration of beet as a grazed summer forage crop. A small scale project was therefore designed to record yield data on arable soils in the region; the free draining sands and volcanic-based soils and the alluvial clays of the market gardening, Ruawai-Dargaville district.

MATERIALS AND METHODS

Three well-cultivated blocks of 300 m^2 were sown by a "Planet Junior" hand planter with sugar beet cv. Amono about 23rd October 1980, at Otakanini (sandy — Whananaki sand), Ruawai (alluvial — Kaipara clay), and Whangarei (volcanic — Whakapai loam). The row spacing was 45 cm and the sowing rate was 6 kg/ha of coated seed. Lenacil at 3 kg a.i./ha was incorporated by rotary hoe immediately prior to sowing and subsequent weeding during the season was by hand. Following sowing, a compound fertiliser was broadcast providing 50 kg/ha of nitrogen, phosphorus and potassium. Transplanting or thinning during December provided a spacing of 20 cm between plants (i.e. 10-15/m^2). In early February, the blocks were each subdivided into eighteen 9 m^2 plots; these plots then being randomly allocated in blocks to three replicates of six harvest dates. Harvests began in February and were conducted at three week intervals (to early June). At each harvest, 2 rows x 1 m from the relevant plot were dug and washed prior to topping (of leaves only), and yield measurements. Juice was squeezed from five bulbs per plot and sugar percentage was calculated by obtaining the % dissolved solids, using hand refractometer and deducting 2% (Quin *et al.*, 1980).

RESULTS AND DISCUSSION

Climate

The trial period was moister, warmer, and with lower sunshine hours than "normal". The rainfall averaged approx. 600 mm from November to April at all sites. However, there was a minor drought at Ruawai from January to early March caused primarily by continuous drying northwesterly winds. The temperature was 1-2 °C above "normal" during January to March at all sites; the mean daily temperatures averaging 20 °C over these months. This weather pattern was sufficiently "normal" to allow cautious prediction of yield expectations based on this single year's results.

Plant establishment

Plant establishment varied markedly between sites and the original intention to sow thickly and thin to the target stand density was only achieved at the Ruawai site. At Otakanini and Whangarei transplanting was required, a labour demand probably caused by the experimental design requirement of sowing all sites about the same date. The seed beds at Otakanini and Whangarei were ready at least three weeks prior to sowing and dryness of the soil surface inhibited a uniform establishment at these sites. Whether sugar beet can be sown to a target stand density in Northland, thereby minimising thinning or transplanting, thus remains unclear.

Weed elimination required continuous hand weeding, particularly at Ruawai, and weed control is clearly the primary cultural problem requiring solution. Diseased plants were rare, but the small scale of this research could well have masked the significance of plant disease.

Yield

Crop yield (bulb green yield inclusive of crown) and sugar yield (Fig. 1) increased over the sampling period at all sites. Since the Otakanini site has provided exceptional yields of other crops (Piggot *et al.*, 1980; Piggot and Farrell, 1980), the results from Ruawai and Whangarei provide fairer indications of a regional yield expectation, i.e. approximately 12 t sugar per ha by late autumn. Such a yield expectation is below that from Canterbury (approximately 15 t/ha — Martin *et al.*, 1982) but local research into cultural methods would probably improve this

expectation. Yields at all sites by late autumn were above the 9-10 t sugar/ha expectation used by Shaw and Farrow (1982) when evaluating the prospects for a beet-ethanol industry in New Zealand. Therefore, if the beet ethanol option in New Zealand ever becomes viable, Northland could not be discounted as a suitable region for beet on the basis of the crop yield expectation.

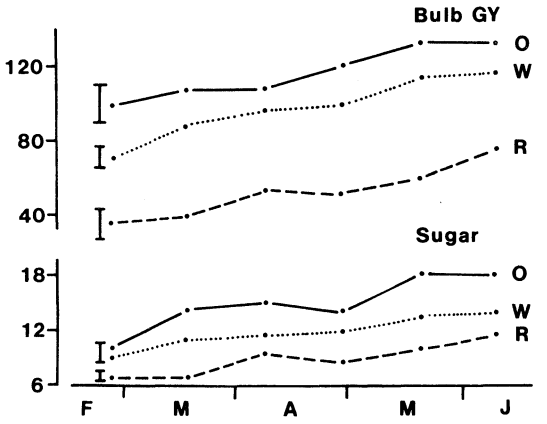

Figure 1: The effect of harvest date on bulb green yield and sugar yield (t/ha) at three sites; Otakanini (_____), Ruawai (———), and Whangarei (...). Bars represent S.E.s for individual sites.

The combined dry matter (DM) yield of bulb and leaf (Fig. 2) remained almost static over the sampling period at a high yield relative to similar forage crops such as brassicas (Piggot *et al.,* 1980). Trials associated with this work (*unpubl. data*) eclipsed the beet, but only much later in the autumn. Therefore if the cultural expertise required by beet is available, the crop should be considered by farmers when choosing a summer forage crop. Fodder beet, rather than sugar beet, should be preferred because of easier utilisation by grazing, and the similarity of DM yield (Piggot and Farrell, 1980).

The yield advantage in delaying harvest date agrees with the Canterbury experience (Martin, 1981) but was not as marked, suggesting that early harvesting (in March) could be more financially appealing particularly on winter-wet soils or where a need exists to resow beet land in autumn. Further, this study did not indicate the period when yield declines, which presumably occurs during the late winter or early spring (Martin, 1981). It is conceivable that beet cropping on winter wet (clay) and dry (sands, volcanics) soils could be integrated to prolong the harvesting season, thus improving the utilisation of processing facilities.

In summary, the yield prospects for commercial sugar beet culture in Northland are likely to be similar to other regions in New Zealand where the crop has been promoted. Some special cultural problems such as weed control may

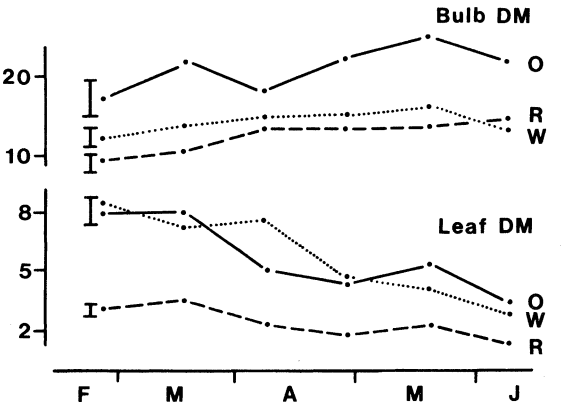

Figure 2: The effect of harvest date on bulb dry matter and leaf dry matter (t/ha) at three sites; Otakanini (_____), Ruawai (———), and Whangarei (...). Bars represent S.E.s for individual sites.

prove more difficult to overcome but advantages in harvest season if contrasting soil types could be integrated may provide a relative advantage over other regions.

ACKNOWLEDGEMENTS

The use of land offered by Otakanini Topu Inc., D.J. Clarke, and Dalgety (N.Z.) Ltd is gratefully acknowledged.

REFERENCES

Martin, R.J. 1981. Growth and yield of sugar beet and fodder beet in Canterbury. *Proceedings Agronomy Society of N.Z. 11:* 5-10.

Martin, R.J., Bidwell, V.J., Dent, J.B. 1982. Evaluation of beet production for ethanol in New Zealand. *Proceedings of the 5th International Symposium on Alcohol Fuel Technology 1:* 29-36.

NZERDC 1979. The potential of energy farming for transport fuels in New Zealand. Report No. 46, N.Z. Energy Research and Development Committee, University of Auckland.

Piggot, G.J., Farrell, C.A. 1980. Sweet sorghum and beet crops for energy in northern North Island. *Proceedings Agronomy Society of N.Z. 10:* 3-4.

Piggot, G.J., Farrell, C.A., Stebleton, G.L., Shannon, P.W. 1980. Summer brassica forages in Northland. *Proceedings Agronomy Society of N.Z. 10:* 13-15.

Quin, B.F., Wright, C.E., Woods, P.H. 1980. Measurement of sugar content in fodder and sugar beets. *Proceedings Agronomy Society of N.Z. 10:* 81-84.

Shaw, E.W., Farrow, B. 1982. Production of fuel ethanol from sugar beet in New Zealand. *Proceedings of the 5th International Symposium on Alcohol Fuel Technology 1:* 47-54.