INVESTIGATIONS INTO THE DEVELOPMENT OF OIL SEED CROPS IN NEW ZEALAND

S.H. Manning, C.T. Mortlock, H.T. Young
Dalgety AgResearch,
Dalgety New Zealand Ltd.,
P.O. Box 622,
Timaru.

ABSTRACT

Dalgety AgResearch has carried out trials with oilseed rape, safflower, sunflower and soybean over the last four years. Major emphasis was placed on determining suitable localities for the production of each crop with varietal screening also being conducted.

Of the four crops only safflower has not reached the commercial development stage although economic considerations have led to the abandonment of large plantings of sunflower in the immediate future.

INTRODUCTION

By world standards New Zealand's requirements of vegetable oils are small. However an increasing demand does exist which has recently led to considerable interest in the possibility of establishing an oilseed industry in New Zealand.

Apart from linseed virtually all New Zealand's oilseed requirements are imported. In recent years several researchers have investigated the feasibility of growing various oilseed crops in New Zealand.

Dalgety New Zealand Ltd are interested in oilseed crops for two reasons. As an industry servicing farmer requirements any developments within the primary sector must be closely observed if customer service is to be maintained. Secondly the Dalgety group have a specific requirement for oilseeds for a subsidiary company which is at present developing a polyunsaturated supplement for ruminant livestock.

PROCEDURES AND RESULTS

The aims of Dalgety AgResearch are to examine the feasibility of growing new varieties and new crops on a commercial scale with the consequent promotion of these crops where they can be shown to be profitable for the farming community and commercial interests alike. Generally this involves crop screening, often under strict quarantine on the company's properties, followed by observational crops grown throughout the country on ground loaned or leased from co-operating farmers. Where initial investigations show promise this is followed by small scale commercialisation where the company ensures minimum financial risk to farmers by subsidising production. Further development is then carried out as a normal commercial exercise of the company.

Dalgety have been investigating four oilseed crops in recent years. Details of protein, fat content and fat composition of these crops are listed in Tables 1 and 2.

TABLE 1: Protein and fat content of four oilseed crops

Crop	Crude Protein %			Fat %		
	NZ Ave	NZ Range	O'seas Ave	NZ Ave	NZ Range	O'seas Ave
Sunflower	15	13-20	15	40	33-47	40
Safflower	18	17-18	18	23	22-23	36
Rapeseed	20	17-21	21	42	39-45	42
Soybeans	40	34-40	40	18	16-22	20

TABLE 2: Fat composition of four oilseed crops

Crop	Fat Composition %						Linoleic acid % Seed Weight (NZ)
	P	S	O	L	L	Other	
Sunflower	6	5	16	74	-	-	29
Safflower	7	4	12	77	-	-	18
Rapeseed	6	2	53	26	12	Trace	11
Soybeans	11	4	28	56	3	-	11

Oilseed Rape

There are two types of rapeseed, the annual type which is usually spring sown and the biennial type which is autumn sown. South Island farmers, particularly in Canterbury and Otago have for many years grown biennial rapeseed for forage crops.

In recent years plant breeders especially in Canada, Sweden and Germany have carried out considerable research into producing varieties suitable for the oilseed and stockfood industries with particular emphasis being placed on breeding varieties with low erucic acid and glucosinolate levels.

Dalgety commenced trial work with oilseed rape in 1972 when small areas of two varieties of Canadian origin, Oro and Target were spring sown in several localities. The results of this exercise are shown in Table 3.

TABLE 3: Details of 1972-73 oilseed rape location trials

Location	Variety	Area Sown m^2	Yield kg/ha
Hamilton	Oro	150	2280
	Target	42	1300*
Hastings	Oro	225	2000*
	Target	225	2000*
Masterton	Oro	4200	1280
Timaru	Oro	2500	1780
	Target	3200	1115

* estimated yield

It was observed from these small trials that oilseed rape could be grown satisfactorily in many New Zealand localities although some agronomic problems were apparent. The Hamilton crop of Target was severely lodged; no lodging occured elsewhere. Aphid infestation occured in the Hastings and Timaru crops but little damage was inflicted. Birds attacked the Hamilton crop of Oro; damage was severe.

Further trials were undertaken in the 1973-74 season primarily in South Canterbury. Nine varieties of oilseed rape were sown in April 1973 in a replicated yield trial. The trial was enclosed in a 2.5 ha block of Oro oilseed rape. Plots of each variety were 30m by 3m sown at a rate of 7 kg/ha. Results of this trial are shown in Table 4.

TABLE 4: Agronomic and yield data for nine autumn sown oilseed rape varieties

Variety	Maturity 1 - 5 1-earliest 5-latest	Lodging 1 - 5 1-nil 5-severe	No. Reps Harvested	Yield kg/ha
Oro	1	4	3	1110
Target	1	3	3	1365
CRD Z36	2	3	4	1203
CRD Z95	2	3	4	1161
CRD Z105	2	3	4	889
CRD Z99	3	2	0	-
PI 355	4	2	0	-
PI 356	4	1	1	2238
PI 354	5	2	1	1869

This trial was damaged by birds but more so by a severe hailstorm immediately prior to harvest. Varieties showing some resistance to lodging were especially damaged. Badly weather-damaged plots were not harvested. The surrounding crop gave a yield of 1400 kg/ha.

A further varietal trial was sown near Timaru in October 1973. Each variety was replicated four times and plot size and sowing rate were as described for the autumn sown trial. The trial was enclosed in a 2 ha block of Oro oilseed rape. No problems arose within this trial other than aphid infestation prior to flowering necessitating one application of aphicide. Results of this trial are presented in Table 5. Yield differences were not significant. The surrounding crop gave a yield of 1200 kg/ha.

TABLE 5: Yield data for six spring sown oil seed rape varieties

Variety	Moisture at Harvest %	Yield kg/ha
Oro	9.5	1654a
Tower	9.5	1428a
PI 384	10.1	1548a
Midas	10.2	1631a
PI 386	11.1	1542a
PI 387	13.5	1452a

* Yields corrected to 10% moisture

From information available spring sown oilseed rape appears an economic crop to grow on a gross margin basis. The present contract price of $200/tonne compares favourably with competitive spring sown crops in the South Island.

Safflower

As a source of polyunsaturated fatty acids safflower is most desirable. However total fat content of the seed is lower than in sunflower and rapeseed.

Investigations into the possibility of growing safflower in New Zealand have been carried out by DSIR in previous years with disappointing results, the major problem being the susceptibility of the crop to **Botrytis** head rot at flowering. Apart from selections, by Crop Research Division DSIR, for strains resistant to this disease trials with safflower were abandoned.

In 1972 Dalgety obtained from DSIR a small quantity of seed line selected for **Botrytis** resistance. This seed was used to sow small areas of safflower at several locations. Results are shown in Table 6.

TABLE 6: Details of 1972-73 safflower location trials

Location	Acres Sown m^2	Yield kg/ha
Hamilton	385	3024
Hastings	880	3080
Masterton	1500	2100
Blenheim	140	1716
Timaru	16	1190

No disease problems were obvious within these blocks and overall seed quality was fair with a low percentage of unfilled seed.

During the 1973-74 season further blocks of safflower were sown. Yields generally were lower than for 1972-73 due to the drought conditions experienced in the North Island during the growing season. No disease or insect problems occured in any of the crops. One crop in the Hawkes Bay was a failure with a low yield of very poor quality seed. This was attributable to late sowing in a marginal area. Results are presented in Table 7.

TABLE 7: Details of 1973-74 safflower location trials

Location	Area ha	Yield kg/ha	Seed Germination %
Waikato	0.75	2340	91
Hawkes Bay	1.6	1104	5
Wairarapa	2.0	1430	93
Manawatu	2.0	1970	89

Agronomically safflower appears an easily grown crop. However the present variety available in New Zealand while showing **Botrytis** resistance has a low oil content as well as a high hull to kernel ratio which renders it undesirable to the oilseed industry. Should varieties with a higher oil content, lower hull to kernel ratio and with **Botrytis** resistance become available in New Zealand, safflower could become a useful new crop for this country.

Sunflower

Sunflower oil is the preferred oil in New Zealand for manufacture of shortenings and margarines particularly the polyunsaturated types. Although safflower oil is the premium polyunsaturated oil the amount entering world trade is insignificant. Brooker (1973) states that on the New Zealand scene sunflower oil looks to be a better proposition.

Attempts have been made for many years to produce crops of sunflower seed for crushing in New Zealand. Initial crops were grown in Hawkes Bay but suffered severely from both bird depredations prior to harvest and **Sclerotinia** wilt. Attention was then focused on North Otago as a more suitable production site with an area of approximately 100 ha being sown in the 1971-72 season.

In the 1972-73 season crops of Peredovik sunflowers were grown in several locations from North Otago to Waikato. All crops suffered from severe drought during the growing season. Disease was a serious problem only in the North Island crops with birds causing severe losses in only two crops. Details of location and yield are listed in Table 8.

TABLE 8: Location, area and yield of experimental crops of sunflower in 1972-73.

Location	Area ha	Yield kg/ha
Oamaru	2.4	637
Timaru	6.5	1714
Oxford	2.0	889
Cust	5.6	1476
Lobum	7.3	344
Amberley	0.8	1976
Masterton	5.6	410
Hamilton	3.8	926

Further crops were grown throughout the South Island during the 1973-74 season. All crops except one were sown with Peredovik seed, the exception being a crop of Cerneanka in South Canterbury. Although many crops looked promising up until harvest yields were extremely disappointing. Many sunflower heads did not fill completely and this was put down to a long period of dull, moist weather during flowering. Disease was not a problem in most areas however bird depredations were severe in all districts and crops had to be harvested at high moisture contents of up to 50%.

Details of locality, areas sown and yield obtained are presented in Table 9.

TABLE 9: Location, area and yield of sunflower crops in 1973-74 season

Location	Area ha	No Crops	Yield Range kg/ha	Ave Yield kg/ha
Marlborough	8	2	-	513
Central Canterbury	16	10	50-1222	555
Mid Canterbury	45	12	125-1712	770
South Canterbury	11	2	561-996	811
North Otago	52	6	431-1309	736
Southland	20	8	Nil-678	464*
S. Cant. (Cerneanka)	7	1		854

* only two crops harvested

Over the past two seasons some 33 varieties of sunflower have been screened for earliness, height, maturity and yield in comparison with the standard variety Peredovik. Four hybrid varieties included in these trials showed particular evenness of maturity as well as significant earliness, and high yield.

Seven earlier varieties or selections were compared with Peredovik in single blocks last season. Results of this trial are presented in Table 10.

TABLE 10: Agronomic and yield data of eight sunflower varieties

Variety	Moisture at Harvest %	Plant Height cm	Yield at 10% m.c. kg/ha
Krasnodarets	35.5	92	1300
CRD EE	36.0	92	995
CRD V	36.2	89	1047
CRD E	37.0	90	1208
Armaveric	37.3	103	978
Cerneanka	38.5	59	1012
CRD Y	40.0	102	1039
Peredovik	46.2	95	1272

Yields obtained from sunflower crops, particularly during the last season, have been very poor and far from economic. Current world prices for sunflower are such that no great increase in returns to the farmers will result until significant increases in yield and bird protection are evident. The future of sunflowers in New Zealand depends upon the successful development of hybrid sunflowers.

Soyabeans

Soyabeans have been grown experimentally in New Zealand since 1914. Gerlach **et al.** (1971) showed that yields ranging from 2700 kg/ha - 6500 kg/ha were possible.

The commercial planting of soyabeans in Poverty Bay and Hawkes Bay was begun by Fletcher Industries and in 1970-71 yields averaging 3000 kg/ha were achieved.

Investigations showed that significant yield gains could be obtained by innoculating soybeans with efficient strains of **Rhizobium japonicum.** Innoculation became a routine practice from the 1971 season when Dalgety became responsible for the commercial development of soybeans. Increased areas were sown both in Poverty Bay and Waikato using the variety Amsoy. The average yield in Poverty Bay remained at 3000 kg/ha with the Waikato producing 2200 kg/ha.

Plantings were again increased in the Poverty Bay area in 1972-73 but severely reduced in the Waikato. The highest yield in Poverty Bay was 3800 kg/ha with no improvement in yields in the Waikato. An area of 9 ha was planted in Blenheim for seed production yielding 2700 kg/ha.

In 1973-74 over 500 ha were grown in New Zealand comprising 490 ha in the Poverty Bay/East Coast region, 30 ha in the Wairarapa and 8 ha in Blenheim. Due to a difficult harvest season average yields in Poverty Bay were below previous years. The highest yields increased to above 4000 kg/ha. Wairarapa crops ranged between 2000 and 2700 kg/ha.

Current production can be fully utilised in New Zealand as whole beans. Owing to present prices for competing crops such as maize it is doubtful if sufficient area to warrant establishment of an oil extraction plant can be obtained. Further development of soybeans in New Zealand will depend upon the future availability of varieties which can extend the present limited production area.

DISCUSSION

For the last three seasons soybeans have been in the commercial development stage, primarily concentrated

in the Poverty Bay district. Development crops of rape seed were grown last season and substantial commercial plantings are planned for the 1974-75 season. Attempts to commercialize sunflower over the past two seasons have met with little success. Further research is required before safflower can be considered for commercial plantings.

REFERENCES

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