SK-1
1989

Final Report

"MAXIMUM YIELD CANOLA PRODUCTION"

A Three Year Program

Sponsored By:

Potash & Phosphate Institute of Canada

Prepared By:

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In 1986 the Saskatchewan Canola Growers Association, under the Grow With Canola Program, undertook to implement a three year project proposed by the Potash & Phosphate Institute of Canada on the yield potential of canola under increased fertilization.

The project was to run for three years: 1986, 1987, 1988.

OBJECTIVE:

1) To determine the maximum yield of canola on a commercial farm using field-scale equipment.

2) To determine the response of present canola varieties to high levels of fertility and other management practices.

WORK PLAN:

Field scale demonstration plots were set up on a commercial farm. Throughout the three year program one primary site was established. As well secondary sites were used each year. While the primary site remained constant, the secondary sites were set up at different locations each year.

The sites were as follows:

Primary Site: 1986 - 1988

Lorne Christopherson farm
Weldon, Sask.

Varieties used: Tobin and Westar
(1988 included Delta)

Secondary Sites:

1986: Hubert Esquirol farm
Meota, Sask.

Variety: Tobin

1987: Norm Maze farm
Phippen, Sask.

Variety: Tobin

1988: Tim Crossley farm
Moosomin, Sask.

Variety: Westar

The use of one primary site throughout the project provided a constant factor, thus making the comparative data more reliable.

The use of various sites throughout the province for the secondary plots enabled the observation of varying climatic and field conditions as well as soil types and different management skills of the cooperators taking part in the demonstration.

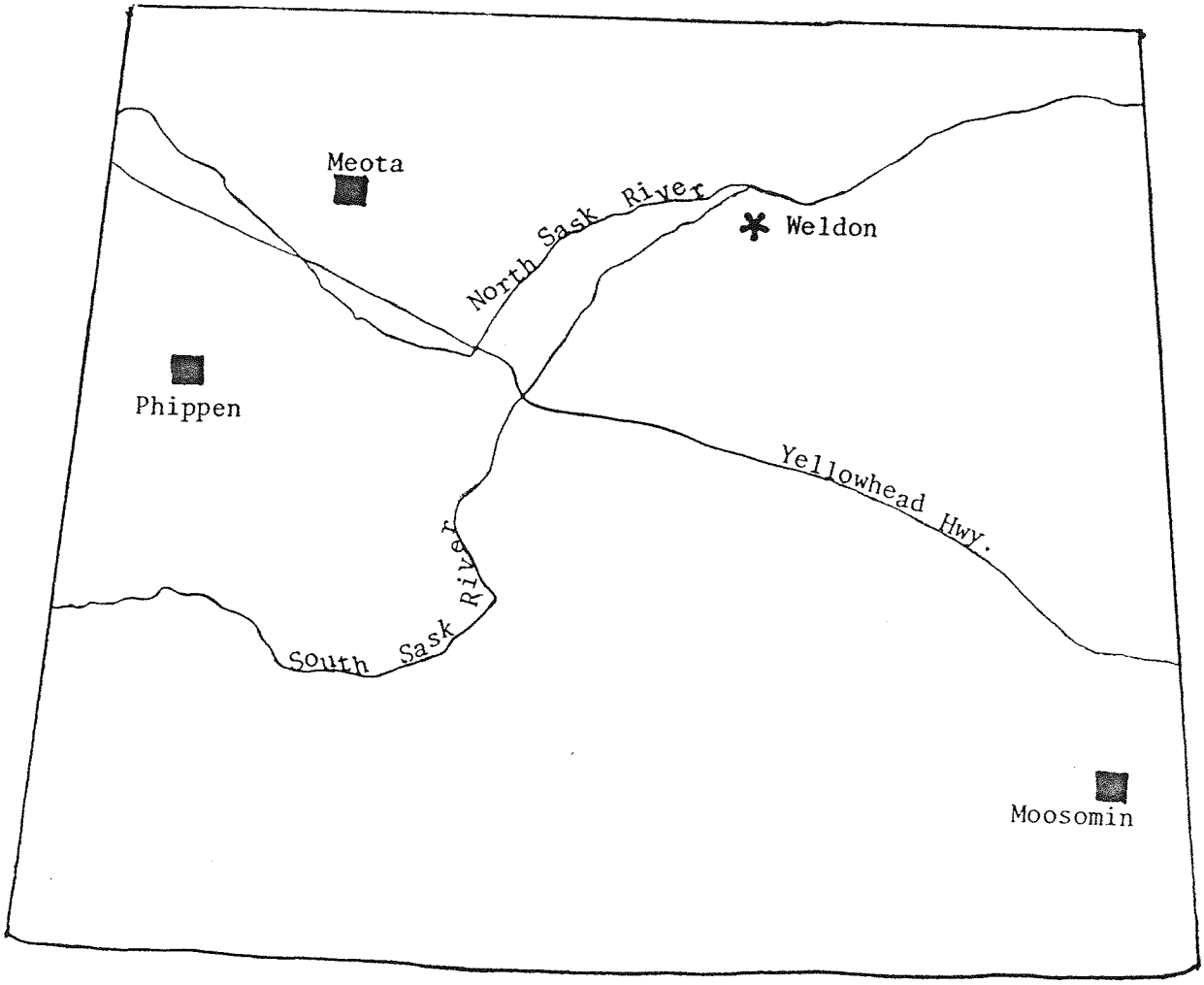
At each location plots with fertilizer rates equal to or greater than that recommended by the Soil Testing Lab was compared to plots fertilized at a rate considerably above the recommended rate.

These plots were established for demonstration purposes and with the intent of comparison between levels of fertilization. As such, there was repetition from year to year but no replication within a given year.

Maximum Yield Canola Production Demonstrations

1986, 1987, 1988

Plot Locations



* Primary Site

■ Secondary Sites

FACTORS AND VARIABLES

1) Double Seeding:

This management practice was tried in 1986 to develop

- narrower row spacing
- better weed competition
- more efficient use of fertilizer

Seeding rates in the double seeded plots were cut to half the normal amounts, to allow for an even distribution of seed by the narrower row spacing.

The objective of this practice was to have a denser crop canopy which would provide a greater degree of weed competition and allow for a vigorous canola plant to develop.

Plants with a higher degree of vigor would require a higher rate of fertilizer.

The plants would be able to make more efficient use of available nutrients.

The problem that developed with the double seeding practice was that the major portion of plants emerged from the second seeding operation. Only a small number of plants emerged from the first seeding operation, in some large areas none at all emerged. The second seeding acted as a packing operation on the first seeding.

This practice was not continued because of unfavorable results and the financial feasibility of two seeding operations did not seem warranted. Grow With Canola demonstration data from all three prairie provinces had indicated in past years that there was no advantage to the practice of double seeding with the types of seeding equipment available to producers at that particular time.

2) Variety

Demonstrations were conducted using both Tobin and Westar each year. The primary location used both varieties while the secondary sites used Tobin only in 1986 and 1987 and Westar in 1988.

As well in 1988 a third variety, Delta (WW1449) was used at the primary site.

3) Seed Treatment

All 1986 plots were seeded with Can-O-Cote seed. In 1987 Can-O-Cote seed was originally used. However, poor germination and weed competition necessitated re-seeding of the Phippen site. this was done with uncoated certified Tobin seed.

In 1988 all the Moosomin plots were seeded with Can-O-Cote, while the Weldon site used uncoated seed treated with a fungicide/ insecticide.

4) Disease

While plots were monitored each year for disease, in none of the three years was there sufficient evidence of either Sclerotinia of Blackleg to effect the yield. Spraying of a fungicide for Sclerotinia was not warranted.

5) Weather

Normal weather conditions were prevalent in 1986, however strong winds following swathing at the Weldon site resulted in substantial yield loss to one plot, as is noted in the yield results.

In 1987 a dry spring resulted in poor germination and heavy weed pressure. While rainfall was adequate throughout the remainder of the growing season, extremely hot weather in late July had an adverse effect on the yield of the Tobin which was still in bloom.

Drought conditions prevalent throughout most of 1988 affected plant development at both sites. As well excessive heat during the flowering stage of the Tobin plots at Weldon resulted in reduced yields.

OBSERVATIONS:

1) Maturity:

The maturity of Westar did not seem to be affected by higher fertilization. Although the flowering period appeared to be longer the differences seemed to disappear at swathing time.

Higher degrees of fertilization did seem to have a more noticeable affect on the Tobin (and Delta in 1988) which took 4 - 6 days longer to mature. The Delta also bloomed approximately 4 days longer.

2) Plant Height:

While the drought conditions which prevailed throughout much of of the three year period limited the height of the canola crop, there seemed to be little difference noticed with the varying degrees of fertilization.

3) Fertilizer Utilization:

Observations at the 4 - 6 leaf stage (1988) indicated a larger leaf area index in the higher fertilization plots as well as a much darker green color in the leaves of these plants. This would indicated the plants ability to utilize the increased amount of nutrients when provided.

DATA ANALYSIS AND INTERPRETATION

Seed samples from each plot were taken each year and submitted to the Canadian Grain Commission where a quality analysis was conducted. Here the seed was analyzed as to protein and chlorophyll levels, oil content, grade, dockage, percentage amount of green seed, glucosinolate levels and free fatty acids were also recorded.

Oil & Protein:

Generally, higher fertilization resulted in higher protein levels but lower oil content.

Chlorophyll Levels:

Increased fertilizer use consistently resulted in higher parts per million of chlorophyll in the seed.

CONCLUSIONS

When this project was first initiated in 1986 the focus was to illustrate the highest attainable yield that canola would reach under higher than normal fertilizer inputs.

The assumption at that time was that we would experience normal climatic conditions conducive to normal plant development and crop yields. This of course did not occur throughout most of the 3 year term of the project.

The weather conditions in two out of the three years did however permit us to experience a variety of growing conditions where valuable information could be gathered. Results generated indicate that fertility is not only essential for plant development during optimum moisture conditions but just as important, if not critical, during limited moisture conditions.

The key factor seems to be that if fertility levels are sufficient the canola plant is able to utilize whatever available moisture its roots have access to. In this way the canola is capable of reaching its full yield potential for the growing conditions that it has been subjected to. The increase in yields may not be proportionate but would be higher than would otherwise have been realized.

Once a producer has determined the fertility levels of the soil he can develop a well planned fertilizer program including proper crop rotations and management techniques. The organic matter and nutrient levels of the soil can then be increased. These fertilizer levels can also be maintained over the long term. Once nutrient levels are built up to the desired levels they are quite easily up-held with close observation and a quick response to the soil's nutrient needs.

The economic feasibility of the higher inputs of fertilizer was not a consideration of the project. The objective was to outline that higher canola yields are attainable if a producer puts extra effort into his fertilization program and develops his/her management skills and practices.

This can be done by understanding all available options and maximizing those alternatives that may be within the control of the producer. Each individual producer must set his/her own yield goals to coincide with the economic environment in which they operate. This may differ substantially from one producer to another. By doing this the chances of increasing higher net returns are quite conceivable.

In conclusion, despite adverse weather conditions experienced throughout much of the project, the objectives of the program have been achieved. While not as obvious as perhaps anticipated, the results have clearly demonstrated the ability of canola to make use of increased fertilization and in turn produce higher yields.

Higher levels of fertilizer has also shown to affect the composition of the seed by increasing protein and chlorophyll levels while reducing oil content. These factors must all be considered in determining the feasibility of such applications.

The decision as to the maximum degree of fertilization ultimately lies with the producer and is dictated by the equilibrium between the soil's requirements and the economic climate.

Lorne Christopherson - Weldon, Sask.

1986

Comparative Data

	TOBIN			WESTAR		
	Single Seeded Low Fertility Check	Single Seeded High Fertility	Double Seeded High Fertility	Double Seeded High Fertility	Single Seeded High Fertility	Single Seeded Low Fertility Check
Fertilizer lbs/ac	N 71 P 50	N 177 P 89 K 100 S 25 B 2	N 177 P 89 K 100 S 25 B 2	N 177 P 89 K 100 S 25 B 2	N 177 N 89 K 100 S 25 B 2	N 71 P 50
Plants/M2						
-Emergence	107	114	124	79	73	76
-Harvest	104	112	114	75	74	73
Weeds/M2 (predominatly flax)	10	33	21	25	21	12
Dockage	4%	3.5%	3.5%	3.5%	3.5%	6%
Net Yield Bu/Ac	32.3	29.7*	41.8	50.2	47.6	38.9
% of Check Yield	100%	92%	129%	129%	122%	100%
Canadian Grain Commision Grade	#1 CAN	#1 CAN	#1 CAN	#2 CAN	#2 CAN	#2 CAN
PPM Chlorophyll	5	5	5	24	27	21
% Green Seed	2%	2%	2%	3%	4.6%	2.2%
% Oil	42.1%	N/A	41.3%	42.3%	42.7%	45.4%
% Protein	37.3%	N/A	38.1%	39.9%	40.0%	36.2%

* Severe blowing following swathing resulted in an estimated 25% yield loss.

Hubert Esquirol - Meota, Sask.

1986 - Tobin

Comparative Data

	Plot A No Fertilizer	Plot B Single Seeded High Fertility	Plot C Double Seeded High Fertility	Plot D Double Seeded Low Fertility	Plot E Single Seeded Low Fertility Check
Fertilizer	Nil	N 200 P 100 K 100 S 50 B 1.5	N 200 P 100 K 100 S 50 B 1.5	N 50 P 25	N 50 P 25
Emergence Plants/M2	177	108	202	248	142
Post Harvest Plants/M2	110	111	178	169	99
Weed Count Per M2	22	13	8	6	13
Dockage	3.5%	2.5%	2.5%	2.5%	4%
Net Yield Bu/Ac	20.8	38.7	35.2	27.0	26.5
% of Check Yield	79%	146%	133%	102%	100%
Canadian Grain Commission Grade	#1 CAN	#2 CAN	#2 CAN	#2 CAN	#2 CAN
PPM Chlorophyll	2	16	14	16	21
% Green Seed	1.2%	3.6%	3.5%	3.4%	4.8%
% Oil	43.5%	39.9%	39.7%	42.7%	42.3%
% Protein	33.8%	38.4%	38.0%	34.5%	34.0%

Lorne Christopherson - Weldon, Sask.

1987

Comparative Data

	TOBIN			WESTAR		
	Single Seeded Normal Fertility Check	High Fertility	High Fertility Plus Boron	High Fertility Plus Boron	Single Seeded High Fertility	Single Seeded Normal Fertility Chk.
Fertilizer lbs/ac	N 70.5 P 25.5	N 200 P 107 K 100 S 25	N 200 P 107 K 100 S 25 B 1.5	N 200 P 107 K 100 S 25 B 1.5	N 200 N 107 K 100 S 25	N 70.5 P 25.5
Plants/M2						
-Emergence	42	45	39	47	36	43
-Harvest	24	23	21	23	32	35
Weeds/M2	95	106	77	111	84	75
Dockage	11.7	17.0%	11.4%	5.3%	7.2%	4.8%
Net Yield Bu/Ac	25.2	24.3	26.7	35.9	37.2	39.4
% of Check Yield	100%	96.4%	106%	91.1%	94.4%	100%
Canadian Grain Commision Grade	S.A.A	S.A.A.	S.A.A.	S.A.A.	S.A.A.	S.A.A.
PPM Chlorophyll	15	21	21	34	35	18
% Green Seed	3.4%	5.4%	2.6%	5.2%	6.6%	2.2%
% Oil	35.2%	33.3%	34.0%	39.3%	40.4%	42.6%
% Protein	35.8%	35.0%	37.0%	40.0%	41.6%	39.1%

Norman Maze - Phippen, Sask.

1987 Tobin

Comparative Data

	Plot A No Fertilizer	Plot B Normal Fertility	Plot C High Fertility
Fertilizer lbs/ac	NIL	N 56 P 25 K 0 S 0 B 0	N 200 P 99 K 53 S 53 B 3
Plants/ M2 Emergence	98	121	69
Post Harvest Plants/M2	N.A.	N.A.	N.A.
Weed Count Per M2	31	18	84
Dockage	3.7%	5.7%	7%
Net. Bushels/ Acre	18.5	18.1	13.98
% of Check Yield	100%	97.8%	75.6%
Canadian Grain Commission Grade	#2 CAN	#2 CAN	#3 CAN
PPM Chlorophyll	18	27	32
% Green Seed	3.8%	6.0%	7.0%
% Oil	42.8%	40.3%	38.7%
% Protein	36.4%	37.8%	38.7%

Lorne Christopherson - Weldon, Sask.

1988

Comparative Data

	Tobin		Delta	Westar	
	Soil Test Recom.	High Fertility	High Fertility	High Fertility	Soil Test Recom.
Fertilizer lbs/ac	N - 77 P - 25.5	N - 189 P - 100 K - 56 S - 23.5 B - 1	N - 189 P - 100 K - 56 S - 23.5 B - 1	N - 189 P - 100 K - 56 S - 23.5 B - 1	N - 77 P - 25.5
Plants/m2					
-Emergence	153	132	91	109	108
-Harvest	118	77	79	101	94
-Weed/m2	25	15	24	14	20
Dockage	4%	4%	4%	4%	4.5%
Net Yield Bu/Ac	15.9	20.8	34.6	33.8	27.9
% of Check Yield	100%	131%	124%	121%	100%
Can. Grain Comm. Grade	#1 Cda	#1 Cda	#1 Cda	#2 Cda	#2 Cda
PPM Chlorophyll	9.0	10.8	17.8	27.5	21.8
% Green Seed	1.0	2.0	2.0	3.0	2.5
% Oil	40.9	38.5	38.8	40.0	42.6
% Protein	39.8	42.8	45.1	45.9	43.9

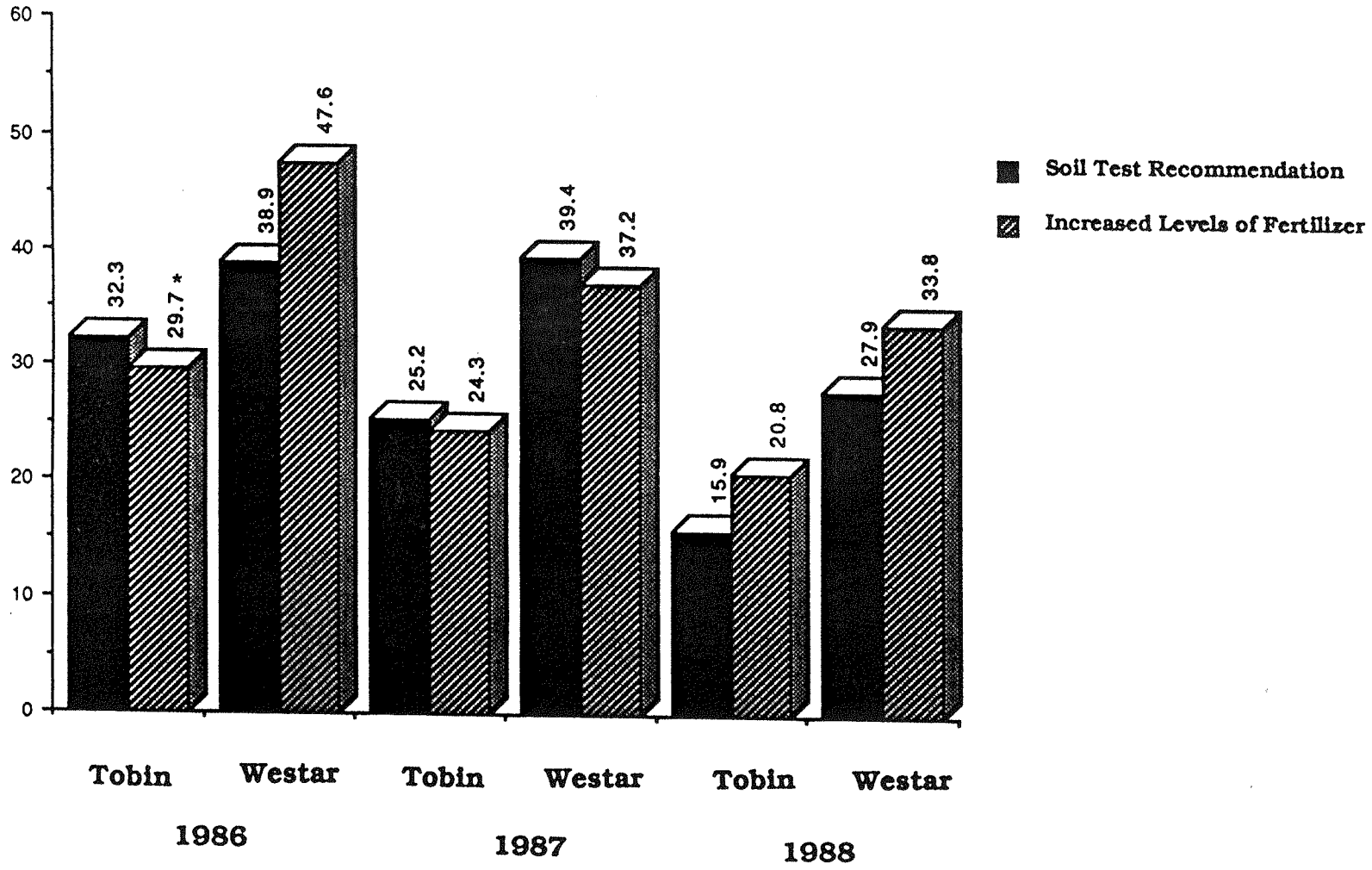
Tim Crossley - Moosomin, Sask.

1988 Westar

Comparative Data

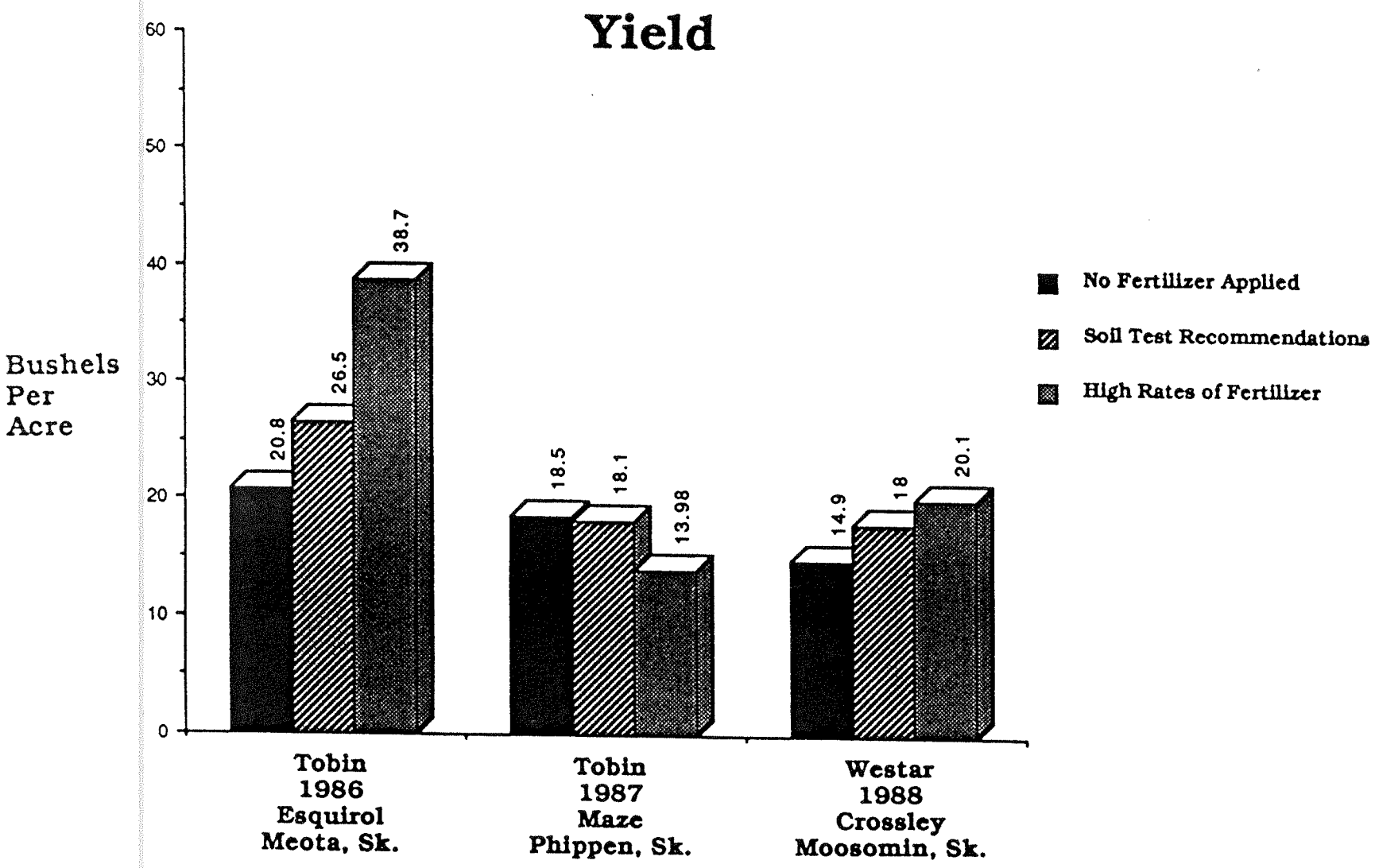
	No Fertilizer	Soil Test Recommendations	High Fertility
Fertilizer lbs/ac	Nil	N - 4.4 P - 20.8	N - 200 P - 100 K - 100 S - 30 B - 2
Plants/m2			
-Emergence	114	126	103
-Post Harvest	90	101	72
-Weed Count/m2	9	5	8
Dockage	2.5	3.0	3.5
Net Yield Bu/Ac	14.9	18.0	20.1
% of Yield Check	83%	100%	112%
Can. Grain Comm. Grade	#1 Cda	#1 Cda	#2 Cda
PPM Chlorophyll	24.7	26.7	40.3
% Green Seed	1.5	2.0	4.0
% Oil	41.5	41.4	37.8
% Protein	42.3	42.4	39.2

Lorne Christopherson Farm
3 yr Comparative Data - Net Yield

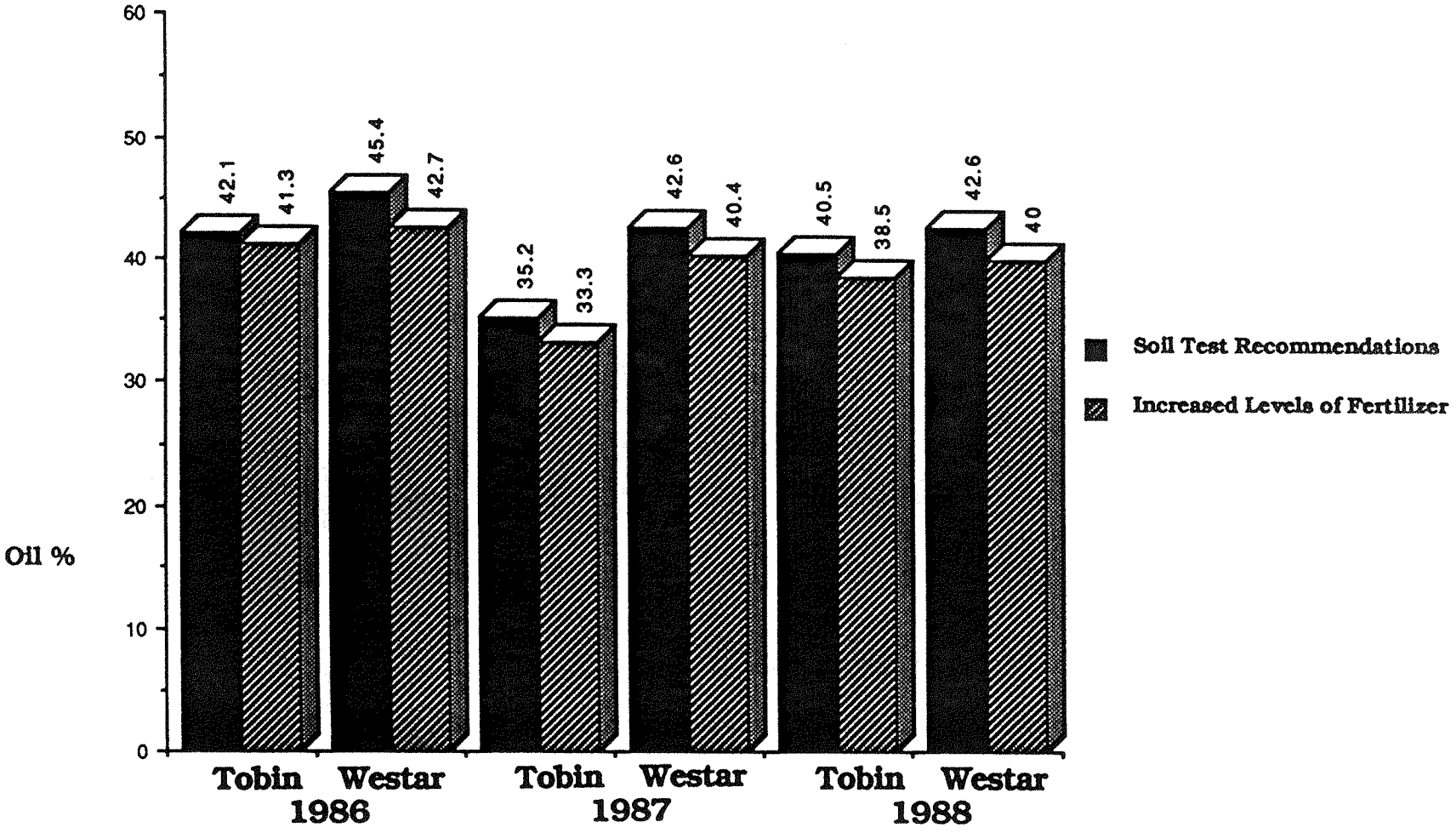


*** Severe blowing following swathing resulted in estimated 25% yield loss.**

3 yr Co-operator Comparative Data

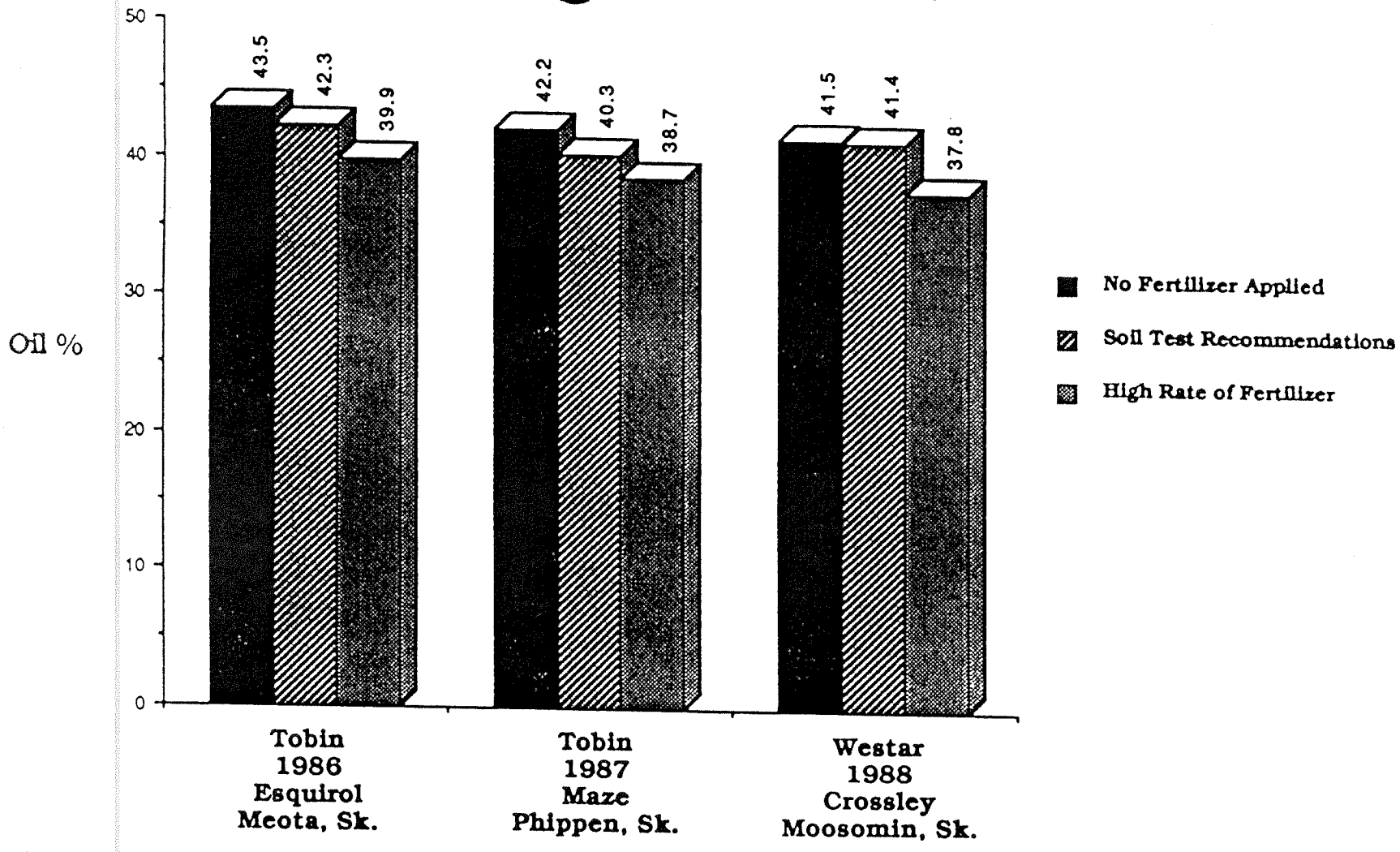


Lorne Christopherson Farm
3 yr Comparative Data

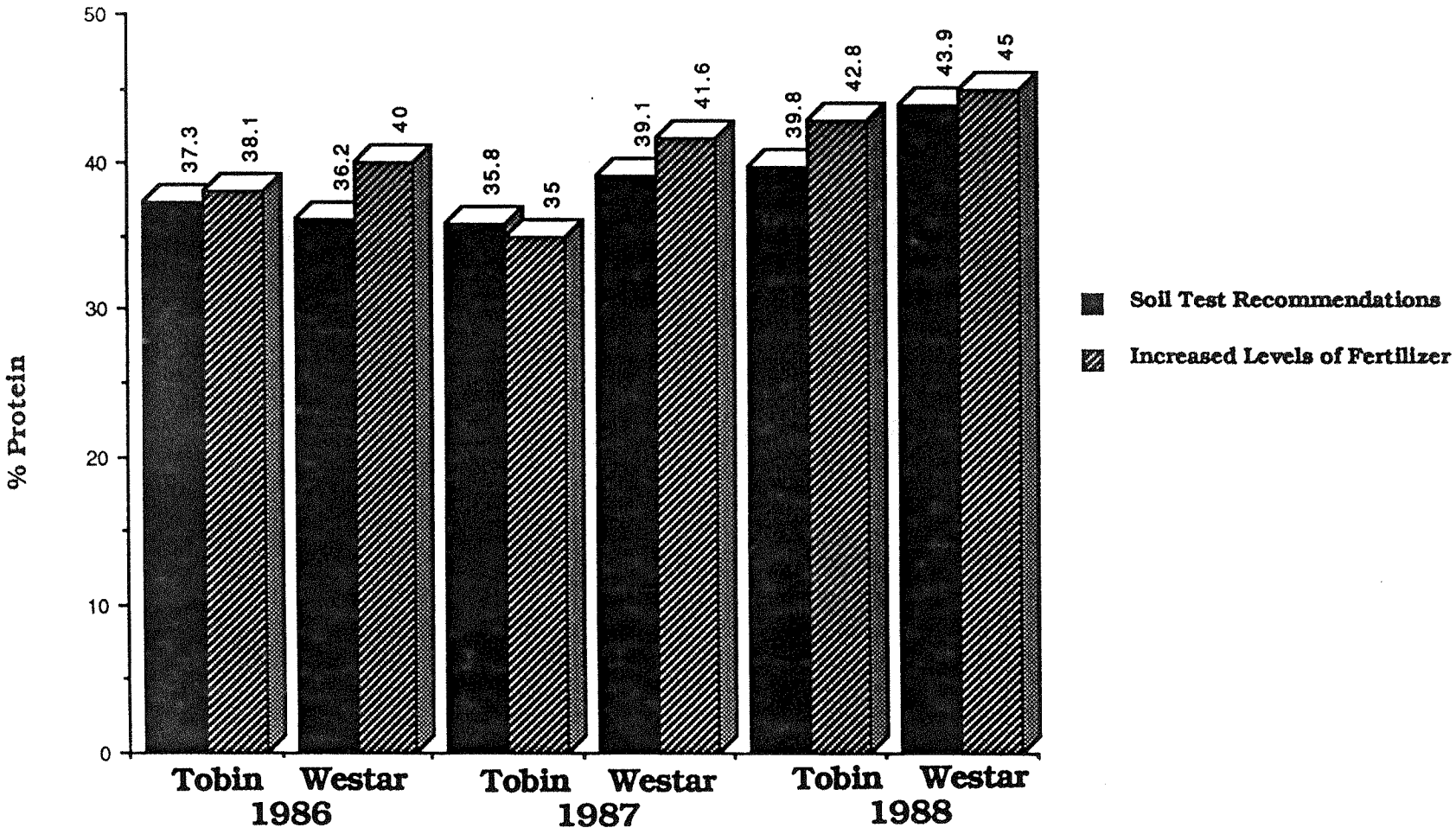


3 yr Co-operator Comparative Data

Percentage Oil Content



Lorne Christopherson Farm
3 yr Comparative Data



3 yr Co-operator Comparative Data