The University of Manitoba

A GEOGRAPHIC ANALYSIS OF THE SUNFLOWER INDUSTRY IN MANITOBA

by

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ABSTRACT

The principal objective of this study is to trace the development and growth of the sunflower crop in Manitoba from its introduction on a commercial basis to the present-day. Within this general framework, the more specific goals are:

(a) To reveal the reasons for the introduction of sunflowers in Manitoba.

(b) To ascertain the reasons for constructing a processing firm at Altona and relate the types of products it manufactures.

(c) To determine the location of the sunflower acreage, and identify the climatic and physical conditions of this environment.

(d) To survey the research being conducted to improve the sunflower plant.

The major conclusions of this study may be summarized as follows:

1. Sunflowers, as a commercial crop, were promoted in the Altona District of Manitoba in 1943 by the Government of Canada because of the critical shortage of oil-bearing crops during World War II. Although sunflowers did not

fulfill its anticipated role during the war, every year since there has been a fluctuating acreage with stabilization only being evident in the 1960 decade.

2. A few businessmen and leaders from the Altona district realized the implications of a sunflower processing firm and converted this notion into a reality by 1946. The firm has proved successful and is today an efficiently operated, financially-sound business, manufacturing quality products in the form of crude oil, refined oil and meal.

3. Research conducted by a number of agencies has been influential in the continuance of sunflowers in Manitoba. The Canada Department of Agriculture Research Station at Morden has played the dominant role by developing, testing and introducing varieties suitable to the local environment.

4. The Manitoba acreage is located in the southern portion of the province within the boundary formed by the Red, Assiniboine and Souris Rivers. The entire growing region is in the most advantageous position with respect to temperature, frost-free season, precipitation and soils.

Since 1970, the Manitoba sunflower acreage has increased markedly. This growth indicates that the role of sunflowers in the provincial economy is becoming more important.

ACKNOWLEDGEMENTS

The writer acknowledges and is indebted to all those persons who provided information through letters and interviews during the preparation of this study. Special recognition is extended to the following: Dr. H.L. Sawatzky, Department of Geography, University of Manitoba who supervised this project and offered constructive criticism during its progress; Dr. E.D. Putt, Director, Research Station, Canada Department of Agriculture, Morden whose background made all his recommendations invaluable; Mr. P. Bergen, Field Representative, Co-op. Vegetable Oils Ltd., Altona who responded generously to all requests for information.

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CHAPTER I

INTRODUCTION

In 1969 Manitoba farmers harvested 8.24 million acres valued at $275,705,000.[1] An infinite variety of crops comprised this acreage, however, the "standard" crops of wheat, oats, barley, and flax accounted for 6.3 million acres.[2] Incorporated within these figures is the sunflower crop which on 48,000 acres had a harvested value of $1,700,000.[3] Although these latter figures, typical of recent years, are not very impressive in comparison to most other crops, the sunflower industry in Manitoba has an interesting history. The fact that it continues to exist in the provincial economy is primarily due to the preservation of the pioneering spirit which played a prominent part in surmounting hardships during the early development of western Canada.

The growing of sunflowers in Manitoba as a commercial crop began in 1943 as a response to the critical shortage of

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[1] Manitoba Department of Agriculture, *Manitoba Agriculture 1969 Yearbook* (Winnipeg: Queen's Printer, 1970), p. 6.

[2] *Ibid.*

[3] *Ibid.*

vegetable oils engendered by the Second World War. Since that time the yearly acreage has fluctuated from a low of 3,000 to a high of 65,000 with an average in excess of 40,000 in recent years. This erratic pattern is an indication of the problems which beset this crop in the Manitoba environment and also provides some evidence of the formidable task in getting the crop established.

The current stabilized acreage, although relatively modest, represents a notable achievement as sunflowers are basically marginal to the Manitoba environment. The initial acreages of this crop in the province, even though of limited success, did nothing to assuage the skepticisms of many farmers. These people pointed out that acreages of sunflowers would be seriously curtailed once the government support price was removed after the war. It was during this period, however, that a small group of dedicated men proposed the construction of a processing plant to counter the possible loss of such acreages. After a remarkable effort a plant was erected in Altona. Later a refinery was added and the facilities enlarged. These events have been important in assuring continuing production of sunflowers.

The concern shown by the Canada Department of Agriculture (C.D.A.) through its Research Station at Morden, Manitoba has also promoted the acceptance and success of of this crop. Their research has developed rust-resistant varieties with earlier maturity and higher oil content as

well as improved cultural practices.

Sufficient interest has been generated since 1964 to foster the holding of several sunflower conferences in Canada and the United States. These sessions deal with current research and the problems which exist in growing sunflowers in the many nations represented. They also attempt to provide, through a common effort, solutions to the many challenges encountered by the participants. Further, they advance the personal exchange of information and ideas on sunflowers, an activity not previously undertaken because of the small acreage of the crop in North America. In turn, the information obtained is used by the processors of sunflower seed to attract new growers and increase total plantings.

In view of the many obstacles which had to be overcome before a degree of consistency in the Manitoba acreage had evolved, one may legitimately ask the reasons for such perseverance. Actually any crop, such as sunflowers, which compares economically with the cereal grains should be promoted as long as there is a market. Certainly the large grain surplus in Manitoba and other Prairie Provinces emphasizes the necessity of growing and experimenting with other crops. The major benefit to the farmer is the insurance inherent in diversification of operations.

The uniqueness of sunflowers in Manitoba has

stimulated the writer to present a thesis on this industry The primary purpose of the thesis is to trace the development and processing of this crop in Manitoba, ascertain the physical environment in which the crop is grown, assess its present importance and attempt to determine its future prospects.

CHAPTER II

DESCRIPTION, HISTORY AND ECONOMIC VALUE OF THE SUNFLOWER PLANT

The commercial sunflower plant is unusual in appearance mainly because of its size. Growing approximately six feet high and seemingly crowned by an oversized head in relation to the stem, it has few, if any, rivals in such a remarkable yearly growth rate in temperate climates. Although its origins are somewhat obscure, the plant is today valued for its high quality oil. The purpose of this chapter is, therefore, to describe the physical appearance of the plant, trace its origins in history and outline its economic significance.

I. Plant Description

The cultivated sunflower, *Helianthus annus* L., is an annual. Many varieties of the annual species exist due to its adaptability to numerous types of soil and climate. As a result there are wide ranges of head size and plant height in both the wild and domesticated state. The following features characterize the commercial varieties

common in Manitoba.

In general, the plant is four to seven feet at maturity. The stalk or stem is hairy, strong, greenish in colour and cylindrical in shape (Figure 1). Large leaves grow alternately from the stalk and are covered with fine hairs. The dominating feature of the sunflower is undoubtedly the large, drooped, circular head which is most prominent as the plant matures (Figure 2). At this stage, the head is five to eight inches in diameter and is filled with a mass of dark greyish seeds. Brightly coloured yellow petals are set around the circumference of the head. These distinguishing features of the head result from the plant belonging "... to the largest natural order of flowering plants, the Compositae, which are characterized by the crowding together of individual flowers into heads."[1] This feature ensures the pollination of a maximum number of flowers by a single insect visit.

The ripened seeds which botanically are akenes or dry indehiscent fruits, vary in size and shape in the different varieties. Their colours also differ but the seed usually varies from grey to almost black with lighter longitudinal stripes on the surface. Some strains and varieties with white seed occur. Figure 1 illustrates the internal structure of the fruit. The actual seed consists

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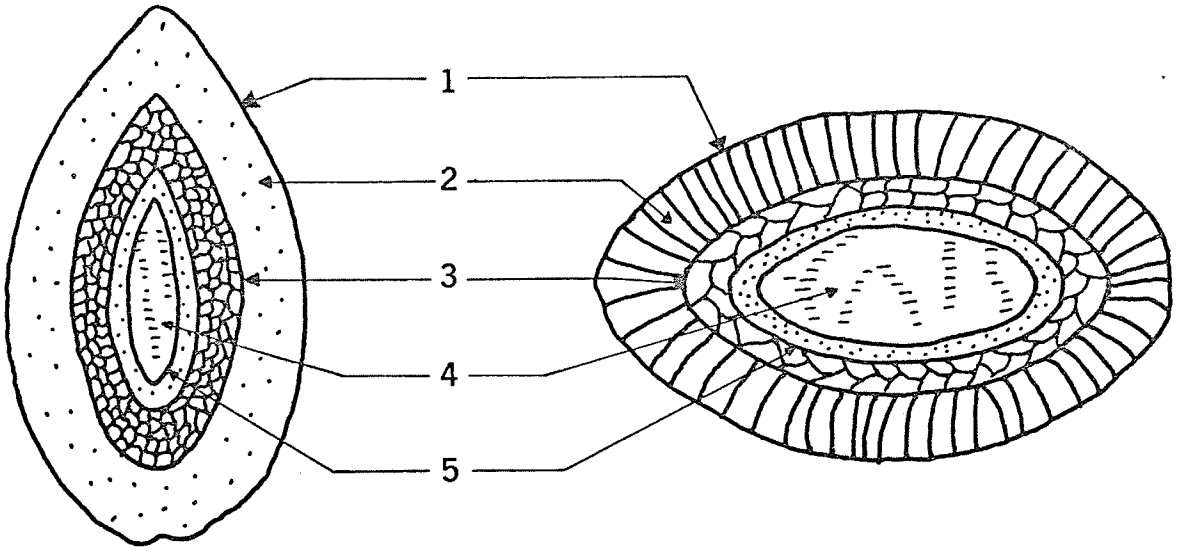
[1] E.F. Hurt, *Sunflower* (London: Faber and Faber Ltd., 1948), p. 47.

FRUIT



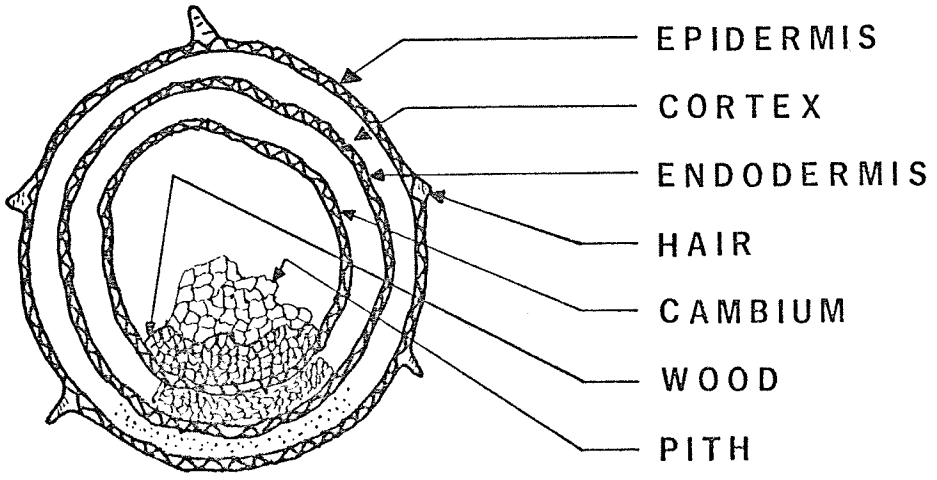
LONGITUDINAL

TRANSVERSE

1 – EPICARP
2 – MESOCARP
3 – ENDOCARP

4 – KERNEL
5 – TESTA

STEM



SOURCE: HURT, E. F., SUNFLOWER

FIGURE 1

FIGURE 2

THE MATURING SUNFLOWER HEAD

of the kernel and the surrounding testa.[2]

The sunflower plant is subject to nutation until the late bud stage. This peculiar process involves a bending and turning of the stems and petioles so that the bud and leaf blade face the sun throughout the day. This heliotropic behaviour ceases shortly before blooming commences. During the remainder of the life of most plants, the bud and later the flower and maturing head face east (Figure 3).[3] The designation "sunflower" is believed to have resulted from this nutation phenomenon. However other authorities give credit for the name to the plant's bright yellow petals being compared to the rays of the sun.[4]

Therefore the sunflower plant, in many respects, is unique in its physical attributes. The major features contributing to its striking appearance are the phenomenal height and the large head which are most evident at maturity and the nutation process which occurs until blooming begins.

II. History

The exact origin of the commercial or cultivated sun-

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[2] Hurt, *op. cit.*, p. 113.

[3] Personal correspondence between Dr. E.D. Putt, Director, Research Station, Canada Department of Agriculture, Morden, and the writer, October 4, 1971.

[4] Hurt, *op. cit.*, p. 47.

FIGURE 3

SUNFLOWER FIELD VIEWED AT APPROXIMATELY 5:00 P.M.
LOOKING WESTWARD. NUTATION HAS CEASED
AND THE HEADS FACE EAST

flower is veiled in history although it is known to be a native of America.[5] More specifically, some authorities place its nativity in either of the regions bordered by the present-day countries of Peru or Mexico.[6] From its cradle in the low latitudes, the plant apparently spread northward. Indians on Roanoke Island, off the coast of the state of North Carolina,were reported growing sunflowers for food in 1586 and for hair oil in New England in 1615.[7] Today the wild or uncultivated sunflower and related subspecies are found in virtually all parts of the United States and the adjacent regions of the Canadian Prairies and Mexico.[8]

The sunflower was introduced into Spain before the middle of the 16th century by Spanish adventurers who came into contact with the plant during their explorations of Central and South America. From Spain the plant was quickly adopted by other countries - Bavaria in 1625 and France in 1787.[9] Continuing to spread eastward, the plant became well ensconced in Southern Russia and from there radiated outward to the Danube region where the countries

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[5] John H. Martin and Warren H. Leonard, *Principles of Field Crop Production* (New York: The Macmillan Co., 1967), p. 933.

[6] Hurt, *op. cit.*, p. 47.

[7] Martin and Leonard, *op. cit.*, p. 933.

[8] Charles B. Heiser, Jr., *et al.*, *The North American Sunflower (Helianthus)*, ed. T. Delevoryas, Memoirs of the Torrey Botanical Club, Vol. XXII, 3 (Durham: The Seeman Printery, 1969, p. 63.

[9] Hurt, *op. cit.*, p. 47.

of Romania and Bulgaria became principal growers, with Hungary, Yugoslavia and Czechoslovakia being secondary.[10]

The improved European type was reintroduced into the Argentine as a commercial crop in 1870 and North America in the mid-1870's.[11] All commercial North American varieties have been derived from the European type or have this type as part of their parentage.

Therefore some three centuries after the wild sunflower was transferred from the New World to the Old World, a reverse migration took place with an improved variety being reintroduced into North America from Europe for commercial production.

III. Economic Value

The sunflower plant is grown primarily for its seed or fruit. The principal economic value of the seed is as a raw product to produce vegetable oil. Although there are many sources of vegetable oils, the most prominent in terms of production and international trade include: castor seed, copra, cottonseed, groundnuts/peanuts, hemp seed, oil palm kernels, linseed/flaxseed, olives, rapeseed, sesame seed, soya beans and tung oil.

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[10] William Van Royen, *The Agricultural Resources of the World*, Vol. I of *Atlas of the World's Resources* (New York: Prentice Hall, Inc., 1954), p. 160.

[11] Hurt, *op. cit.*, p. 47.

All vegetable oils fall broadly into one of three subclasses - edible, edible industrial, and industrial - depending on the composition and final application.[12] The oils within each of these subclasses as determined by export markets are as follows:[13]

Edible	Edible Industrial	Industrial
groundnut oil	copra	rapeseed oil
cottonseed oil	palm kernel oil	linseed oil
soya bean oil	palm oil	castor oil
sunflower oil		tung oil
sesame oil		
olive oil		

Vegetable oils have wide and varied applications from food products, to lubricants, to additives in paint and varnish. As a by-product of their production the meal may be used as an animal feed or fertilizer.

The major use of vegetable oils, however, is as a food product or edible oil. Approximately 70 percent of the total production is consumed in this form.[14] This high consumption as an edible oil is related to an increasing world population, the spread of prosperity and higher living standards, all of which are creating an additional demand for fats.

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[12] *The Shorter Oxford Economic Atlas of the World* (2nd ed.; London: Oxford University Press, 1959), p. 33.

[13] *Ibid.*

[14] *Ibid.*

Prior to the beginning of the twentieth century, fats had been primarily supplied by animals but with the increasing demand for fats this source could not keep pace. A search for effective substitutes was therefore emphasized. In 1909 Crosfield invented the process of solidifying liquid vegetable oil by hydrogenation.[15] This discovery was basic to the development and commercial production of the cheap butter substitute margarine. Lower priced vegetable oils could now be utilized, such as the palm oil of West Africa and coconut oil from the Pacific Islands.

World War II altered the availability of vegetable oils. Where possible, countries attempted to compensate by increasing the acreages of other oil-bearing crops. With the development of new technology it was now feasible to substitute one oil for another, thereby eliminating the reliance upon any one oil. Recently, scientific research has developed synthetics and new processes which have alleviated the dependence upon vegetable oils in some areas e.g. soaps. Regardless of these outstanding technological advances, it is an acceptable premise that the demand for edible oils will continue to increase as population expands.

Sunflower oil, as an edible oil, falls into the subclass which is in greater demand than either the edible

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[15] *Oxford Economic Atlas*, *op. cit.*, p. 32.

industrial or industrial. As mentioned previously, edible oils account for over 70 percent of the entire vegetable oil production. Of this percentage, sunflower seed oil is in fourth place in production after groundnut/peanut oil, cottonseed oil and soya bean oil, accounting for approximately ten percent of the total edible oil production.[16]

The value of sunflower oil is its exceptionally high quality. It compares well with both olive oil and cottonseed oil.[17] Its fatty-acid composition is palmitic and stearic, oleic and linoleic. A major factor contributing to its desirability as a cooking oil is the almost complete absence of linolenic acid. This acid causes a change in flavour in salad oils, a fish taste in cooking oils and a yellowing of white and light pastel paints.[18] Another noteworthy attribute is its high smoke point. In this respect it surpasses such rivals as corn oil, cottonseed oil and peanut oil and is therefore recommended for open vessel heating or frying.[19] The sunflower meal, following extraction of the oil, is high in protein and may be used in non-ruminant rations. It compares well with soya bean and groundnut meal.[20]

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[16] *Oxford Economic Atlas*, *op. cit.*, p. 33.

[17] Eric D. Putt, "Sunflowers," *Field Crop Abstracts*, XVI, 1 (February, 1963), p. 1.

[18] Cargill Vegetable Oil Division, *High-oil Sunflowers* (Minneapolis: [n.n.], [n.d.]).

[19] Eric D. Putt, *Sunflower Seed Production* (Rev. ed.; Altona: Co-op. Vegetable Oils Ltd., 1952), p. 29.

[20] Putt, "Sunflowers," *op. cit.*, p. 1.

Therefore, in summary, most portions of the sunflower seed have an economic value which contributes to the highest possible return. For this reason, plus the indication of assured markets due to the demand from increasing populations, the sunflower industry has the potential of remaining a profitable enterprise.

CHAPTER III

PRODUCING COUNTRIES OF THE WORLD

Although many countries in the world grow sunflowers, only a limited number are major producers. Of these, the Union of Soviet Socialist Republics (U.S.S.R.) produces more than the combined total of all other countries. In the United States and Canada, sunflower acreage is negligible in terms of total world production. This chapter will trace world production in recent years, indicate the producing countries and then focus upon North American growing regions with special emphasis on Canada.

I. World Production

The total production of sunflower seed throughout the world is depicted in Figure 4.[1] This graph represents a general trend of growth although substantial recessions are also evident in the years 1957, 1959 and 1963. The overall increase becomes discernible when the two extremes

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[1] Data for the years prior to 1955 have been omitted as no figures are available for the U.S.S.R. Since the U.S.S.R. is the largest producer in the world, any data without their figures are invalidated.

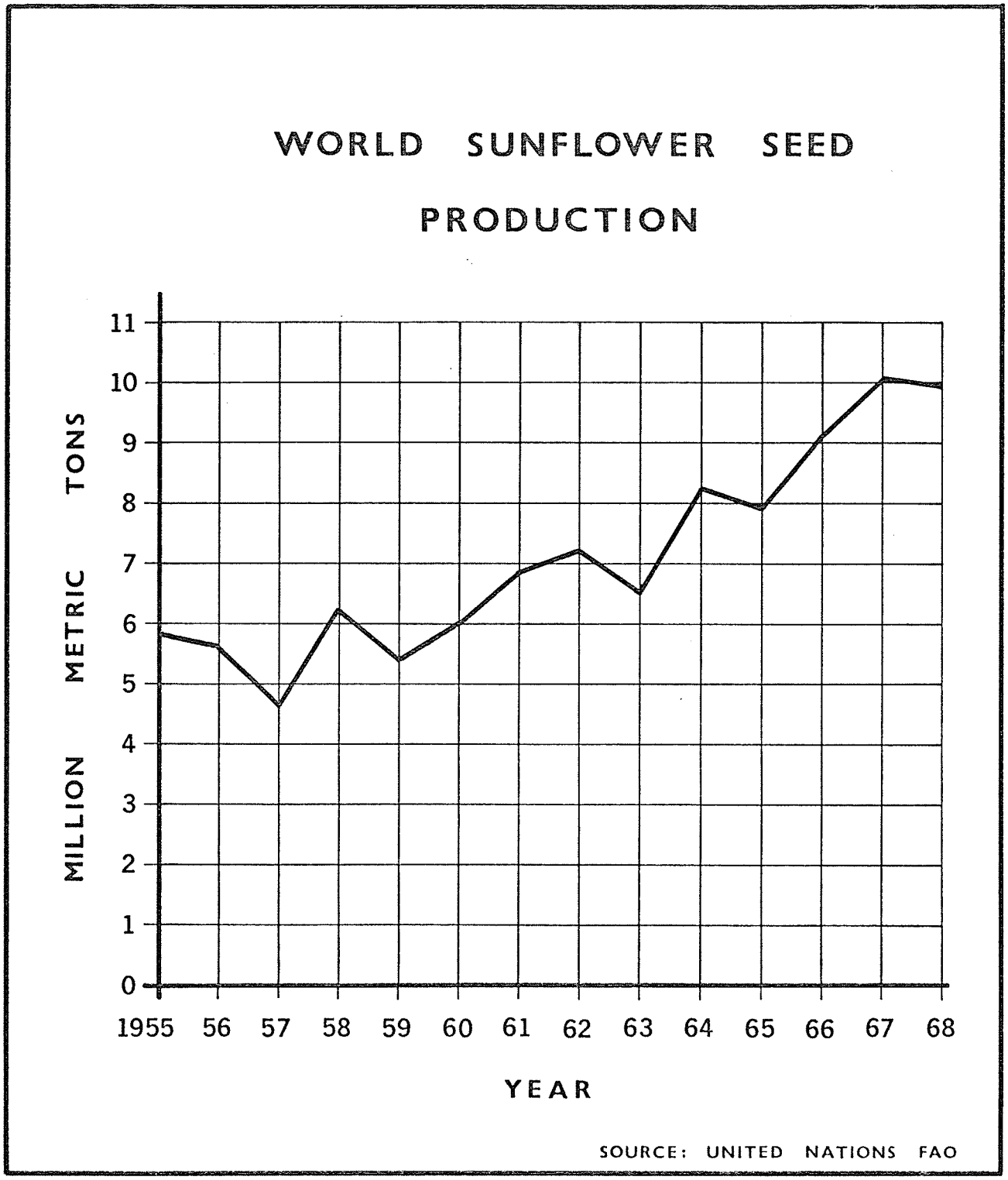

WORLD SUNFLOWER SEED PRODUCTION
MILLION METRIC TONS
0
1
2
3
4
5
6
7
8
9
10
11
1955
56
57
58
59
60
61
62
63
64
65
66
67
68
YEAR
SOURCE: UNITED NATIONS FAO

FIGURE 4

of this time period are compared. Commencing with a total production of 5.8 million metric tons in 1955, there is, by 1968, a yearly production of nearly 10 million metric tons or an increase of approximately 40 percent in 13 years.

Figure 5 illustrates the total area devoted to sunflowers in the world for the same interval as in Figure 4. It will be noted that throughout this 13 year span, the area has remained relatively stable. At the beginning of this period, in 1955, the area was 7 million hectares (one hectare equals 2.47 acres) and at the end, in 1968, the area was 7.8 million hectares or an approximate increase of 10 percent. Clearly the rate of increase in area is less than the rate of increase in production.

Figure 6 shows the world yields in kilograms per hectare for the same period as in Figures 4 and 5. There has been a marked increase in the yield from 800/kg/hectare in 1955 to 1,270 in 1968. This represents an increase of approximately 37 percent.

To summarize, the area planted to sunflowers has not increased to any great extent although yields and total production have improved. The major reason for the gain in yields and production is the research which has developed superior yielding varieties with improved oil content. It may be assumed that the area has not declined primarily due to the increased demand through a wider

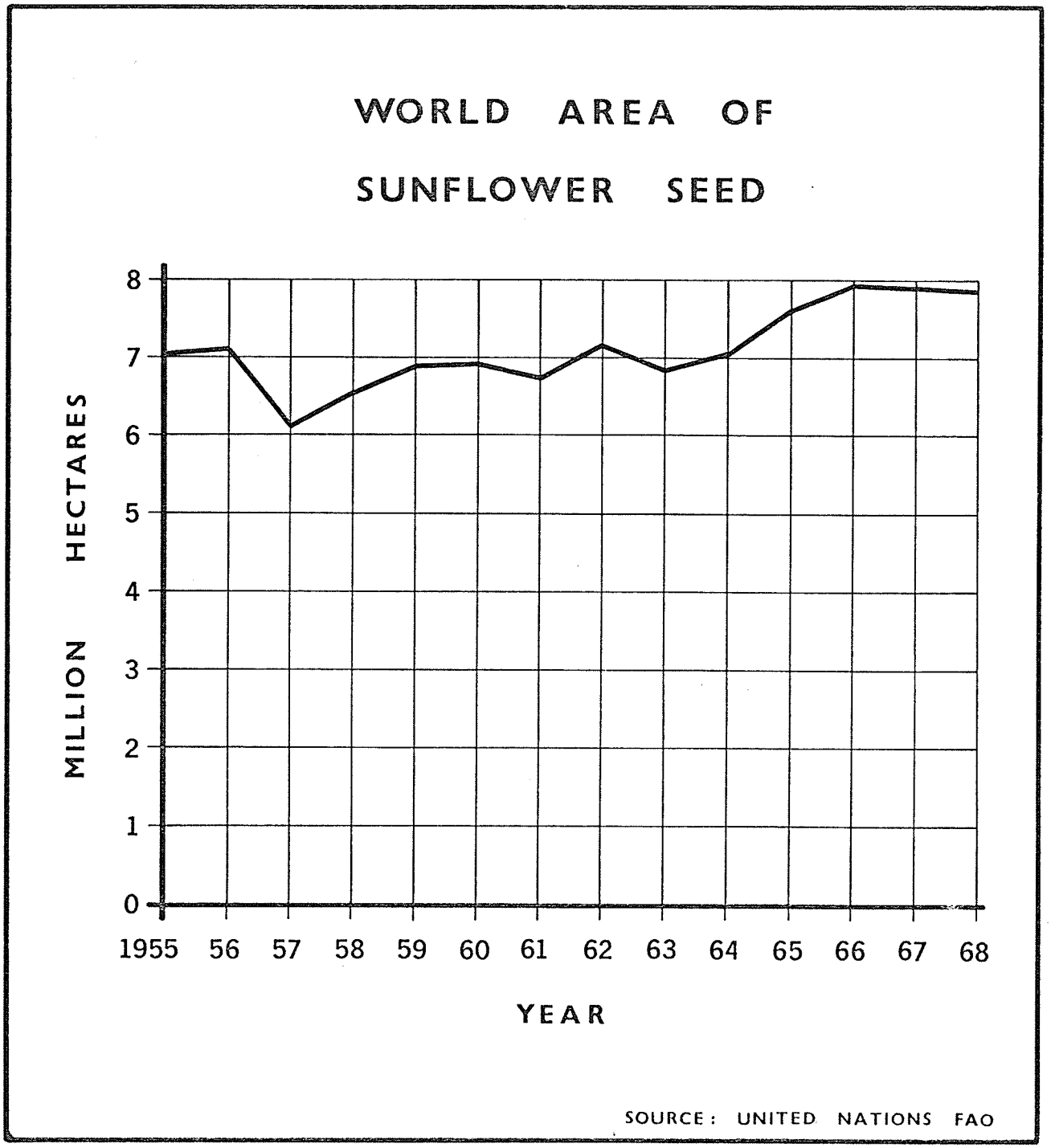

WORLD AREA OF
SUNFLOWER SEED
MILLION HECTARES
0
1
2
3
4
5
6
7
8
1955
56
57
58
59
60
61
62
63
64
65
66
67
68
YEAR
SOURCE: UNITED NATIONS FAO

FIGURE 5

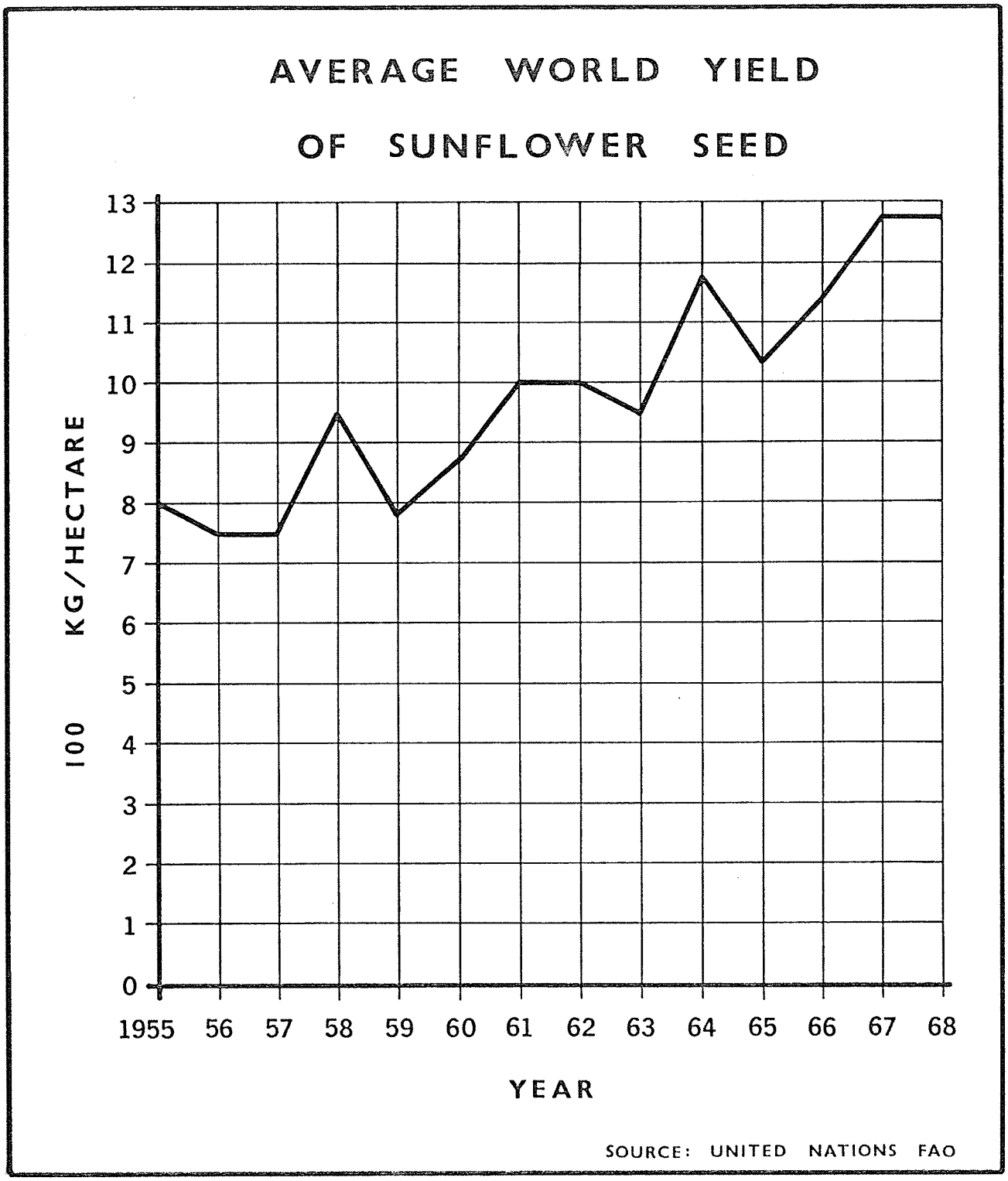

AVERAGE WORLD YIELD
OF SUNFLOWER SEED
100 KG/HECTARE
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1955 56 57 58 59 60 61 62 63 64 65 66 67 68
YEAR
SOURCE: UNITED NATIONS FAO

FIGURE 6

acceptance of sunflower oil. That the acreage has not expanded markedly suggests that other factors such as climatic tolerances and competition from more lucrative crops are operative.

II. Major Producing Countries and Regions

Table I lists, at selected intervals, the major countries growing sunflowers as determined by the percentage of world production. The U.S.S.R. has led in sunflower seed production and continues to do so, maintaining almost 70 percent of the world total for three decades. In second place, although at a smaller percentage, is Argentina, a position she has retained since World War II. Romania, Bulgaria, Turkey, Yugoslavia, and South Africa largely account for the remaining percentages. Many countries are also included in the "others" category among which are the United States and Canada.

The areas of production in the world are shown in Figure 7. Three principal producing regions are the U.S.S.R., the Danube Basin and Argentina. The bulk of the U.S.S.R.'s production is in the Ukraine, Volga and Caucasus regions. The Romanian, Bulgarian and Hungarian

TABLE I

Major World Producers of Sunflower Seed by Percent of World Production - Selected Years

Country (1)	Pre-War (2)	1948-50 (3)	1953-55 (4)	1958-60 (5)	1965 (6)
U.S.S.R.	79	53	66	66	68
Argentina	6	21	8	10	10
Hungary	1	5	-	-	-
Romania	7	4	-	7	7
Bulgaria	5	3	-	5	5
Turkey	-	2	2	2	2
Uruguay	-	2	2	-	-
Yugoslavia	-	-	2	-	4
South Africa	-	-	-	2	-
Chile	-	-	1	-	-
Others	2	10	19	8	4
	100	100	100	100	100

Sources:

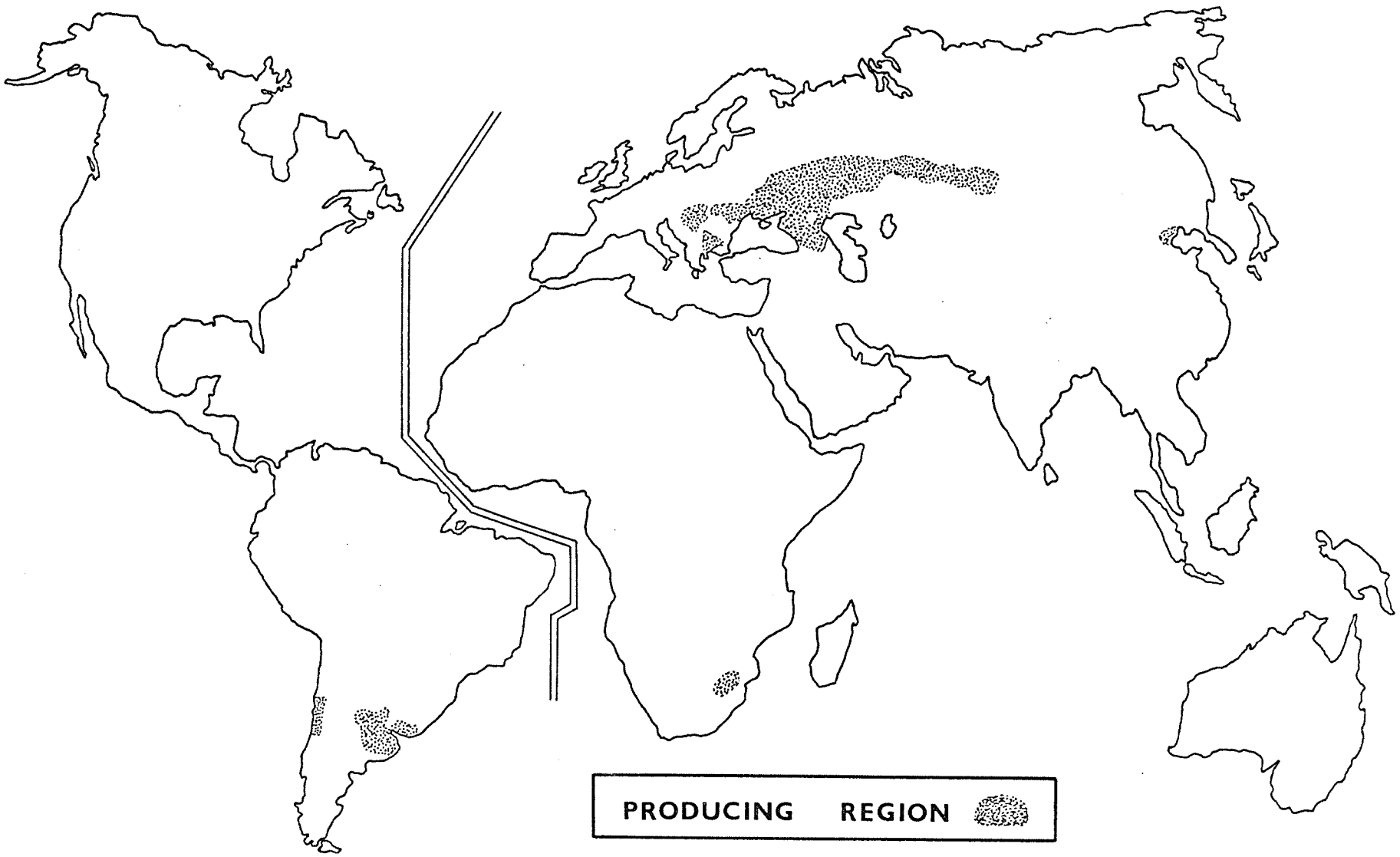
Columns 2 and 3: *The U.S.S.R. and Eastern Europe* (London: Oxford University Press, 1960), p. 43.

Column 4: *The Shorter Oxford Economic Atlas of the World* (2nd, ed.; London: Oxford University Press, 1959), p. 36.

Column 5: *The Shorter Oxford Economic Atlas of the World* (3rd. ed.; London: Oxford University Press, 1965), p. 46.

Column 6: Food and Agricultural Organization of the United Nations, *Production Yearbook*, Vol. 20, 1966, pp. 230-232.

MAJOR WORLD SUNFLOWER PRODUCING REGIONS



SOURCE: SHORTER OXFORD ECONOMIC ATLAS OF THE WORLD, 3RD. ED.

FIGURE 7

production lies primarily along the Danube Basin while Argentina's production occurs mainly in the Pampas, especially in the more humid portion from Mar del Plata to Rosario.[2] The South African and Chilean growing regions are also shown although their production is small on the world scale. Sunflowers, therefore, grow in a variety of climates, with the major production located in the temperate zone from 40 to 50 degrees north latitude.

III. North American Production

A. The United States

The quantity of sunflower seed grown by the United States is extremely small as a percentage of the total world production. Since the acreage is limited, any information on the crop's performance in this country is meagre as it is "not estimated nationally".[3] In spite of its small acreage is relation to other national crops, the plant is well known throughout the country and is the state flower of Kansas.

Commercial production of sunflowers in the United States consists of the oil and other types designed for the

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[2] William Van Royen, *The Agricultural Resources of the World*, Vol. I of *Atlas of the World's Resources* (New York: Prentice Hall, Inc., 1954), p. 160.

[3] Personal correspondence between C.R. Lies, Agricultural Statistician, U.S. Department of Agriculture, Washington and the writer, August 27, 1968.

speciality trade embracing pet feed and large seed for direct human consumption. Although numerous states, such as Missouri, Illinois, Kentucky and Texas grow sunflowers, the major commercial production is concentrated in two separate regions - the Red River Valley of north-central United States and an area wholly within the state of California.[4]

The Red River Valley region comprises an area extending northward from Lake Traverse, located on the state boundary between South Dakota and Minnesota, to the International Boundary with Canada and the province of Manitoba. Most of the production within this district is located adjacent to the Red River which forms the boundary between Minnesota and North Dakota.[5] This is the principal growing area in the United States with acreages in recent years as high as 200,000 as shown in Table II.

Sunflowers were introduced to this region from Manitoba approximately 25 years ago.[6] However, the crop remained in a subordinate position until the late 1950 decade and early 1960 decade due to the presence of volunteer

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[4] L.A. Jensen, C. Swallers and F.K. Johnson, "Sunflower Seed Production in North Dakota" ([n.p.]: [n.n.], 1967), p. 1. (Mimeographed).

[5] Personal correspondence between C.R. Lies and the writer, August 27, 1968).

[6] C.F. Dahlgren, "Report on Commercial Sunflower Production and Processing in Minnesota and North Dakota," Report presented to the First International Sunflower Conference June 17-18, 1964 (College Station: Texas A&M University). (Mimeographed.)

TABLE II

Combined North Dakota and Minnesota Acreages

Year	Acreage
1963	58,000
1964	40,000
1965	46,000
1966	73,000
1967	216,000
1968	154,000

Source: C.J. Heltemes, "Sunflower Seed" (Fargo: North Dakota Crop and Livestock Reporting Service, December 20, 1967). (Mimeographed.)

seedlings and an unstable market.[7] Since then companies who process the seed, e.g. Cargill, have made a concerted effort to increase acreages. Table II demonstrates the effect of this campaign. The acreage expanded to over 200,000 in 1967 and although it declined in 1968 to 154,000, this latter figure still represents a substantial increase over previous years.

Sunflowers in California are grown in the Central Valley focussing on the Delta region at the confluence of the San Joaquin and Sacramento Rivers.[8] Even though sunflowers have been cultivated here for a longer period than in the Red River Valley of the United States, acreages are considerably smaller. Acreages have ranged between 3,000 and 9,000 during each of the 30 to 40 years since their introduction, with the current acreage in the vicinity of 6,000.[9] The region specializes in the non-oil type for the roasting trade, the milling trade and health food trade.[10] It is unlikely that the sunflower acreage in this state will increase much beyond its present extent in the foreseeable future for many reasons - high production

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[7] Dahlgren, *op. cit.*

[8] D. Bondshu, "Report on Commercial Sunflowerseed Production and Processing in California," Report presented to the First International Sunflower Conference June 17-18, 1964 (College Station: Texas A&M University). (Mimeographed.)

[9] *Ibid.*

[10] D.B. Grissom, "Commercial Sunflower Production and Processing in California," Report presented to the First International Sunflower Conference June 17-18, 1964 (College Station: Texas A&M University). (Mimeographed.)

costs, high land values, and competition from both local crops and imported sunflower seed from other states.[11]

Therefore, in summary, sunflower acreages and production in the United States should, according to recent trends, continue to expand although it is difficult, at this time, to forecast with any degree of certainty the probable extent. Of the two major production areas, however, indications are that any major increases will occur in the Red River Valley with the previously mentioned factors continuing to prohibit the expansion of Californian acreages beyond that of a minor crop.

B. Canada

(i) Acreage and Production

Until the beginning of World War II, most of Canada's rather large deficiencies in vegetable oils were obtained from overseas. A substantial portion of these requirements was met by purchasing flaxseed from Argentina and coconut and palm oils from the Far East.[12] The risk to commercial transportation in the Atlantic Ocean due to World War II eliminated the Argentinian source by the end of 1940. Far Eastern shipments ceased shortly after Japan entered the war in December 1941. Therefore, with the suspension of all

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[11] Grissom, *op. cit.*

[12] G.E. Britnell and V.C. Fowke, *Canadian Agriculture In War and Peace 1935-50* (Stanford: Stanford University Press, 1962), p. 341.

external supplies, Canada attempted to compensate by increasing acreages of oil-bearing crops at home.

The oil-bearing seed crops adaptable to the Canadian environment were flax, rapeseed, soybeans and sunflowers. Table III shows the acreage and production of these four crops during the war and immediate postwar period. With respect to sunflowers the Oils and Fats Administrator in the Government of Canada believed in December of 1942, that if a minimum of 100,000 acres were planted to this crop, 70 million pounds of seed or 17 million pounds of oil would be forthcoming.[13] In an attempt to stimulate acreages, a guaranteed price of five cents a pound was introduced.[14]

The Canadian wartime sunflower acreage did not meet expectation. Only 12,000 acres were planted in 1943, rising to 17,000 in 1944 and dropping to 9,000 in 1945 (Table III). The major factor contributing to this small acreage was lack of planting seed. Further, although the government was anxious to obtain the seed to produce the oil, decisions from Ottawa relating to the sunflower program were slow in forthcoming, undoubtedly because of other exigencies more critical in nature due to the war. Therefore substantial acreage increases were evident during the war years in the oil-bearing crops but the sunflower crop never fulfilled its anticipated role during this period.

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[13] Britnell and Fowke, *op. cit.*, p. 347.

[14] *Ibid.*

TABLE III

Acreage and Production of Oilseed Crops in Canada 1935 to 1948

Year	Acres				Production			
	Flax-seed	Soy-beans	Sun-flower seed	Rape-seed	Flax-seed	Soy-beans	Sun-flower seed	Rape-seed
	(thousand acres)				(thousand bushels)		(thousand pounds)	
1935-39 average	307	-	-	-	1,508	-	-	-
1940	382	-	-	-	3,049	-	-	-
1941	1,043	10.9	-	-	6,780	217	-	-
1942	1,536	41.5	-	-	15,470	872	-	-
1943	2,983	35.6	12.4	4.1	18,432	570	5,300	3,000
1944	1,217	36.2	17.3	12.0	8,882	681	6,000	6,600
1945	873	46.2	9.2	20.4	6,225	844	2,906	10,852
1946	886	59.2	23.8	23.7	6,774	1,072	13,356	13,000
1947	1,791	61.0	23.0	58.3	13,822	1,110	16,000	21,862
1948	1,958	94.0	29.0	80.0	18,449	1,824	23,200	64,000

Source: G.E. Britnell and V.C. Fowke, *Canadian Agriculture in War and Peace 1935-50* (Stanford: Stanford University Press, 1962), p. 342.

Since 1948, the Canadian sunflower acreage has varied tremendously, as portrayed graphically in Figure 8. The acreage has fluctuated from a low of 3,000 in 1952 to a high of 69,000 in 1964. The drastic reduction in acreage from 60,000 in 1949 to 3,000 in 1952 is the result of three successive poor crops caused by unfavorable weather and a severe epidemic of rust.[15] The rising trend in acreage from 1952 through to 1959 is a consequence of the development of rust-resistant varieties. Figure 9 sets forth the total production of sunflower seed from the acreage in Figure 8 for the identical time period. The anticipated parallel between the two figures is evident.

Since the introduction of sunflowers into the Canadian economy, the acreage and production have displayed a fluctuating pattern. Commencing in the middle of the 1950 decade, the recovery after each major recession has in most instances surpassed the previous high. This evidence suggests that growth is occurring although at a moderate rate.

(ii) *Acreage Location*

Sunflowers in Canada are grown from Nova Scotia to British Columbia. The greater part of the commercial

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[15] Robert Meyers, *Spirit of the Post Road* (Altona: D.W. Friesen & Sons Ltd., 1955), p. 121; also personal communication between Dr. E.D. Putt, Director, Research Station, Canada Department of Agriculture, Morden and the writer, August 18, 1972.

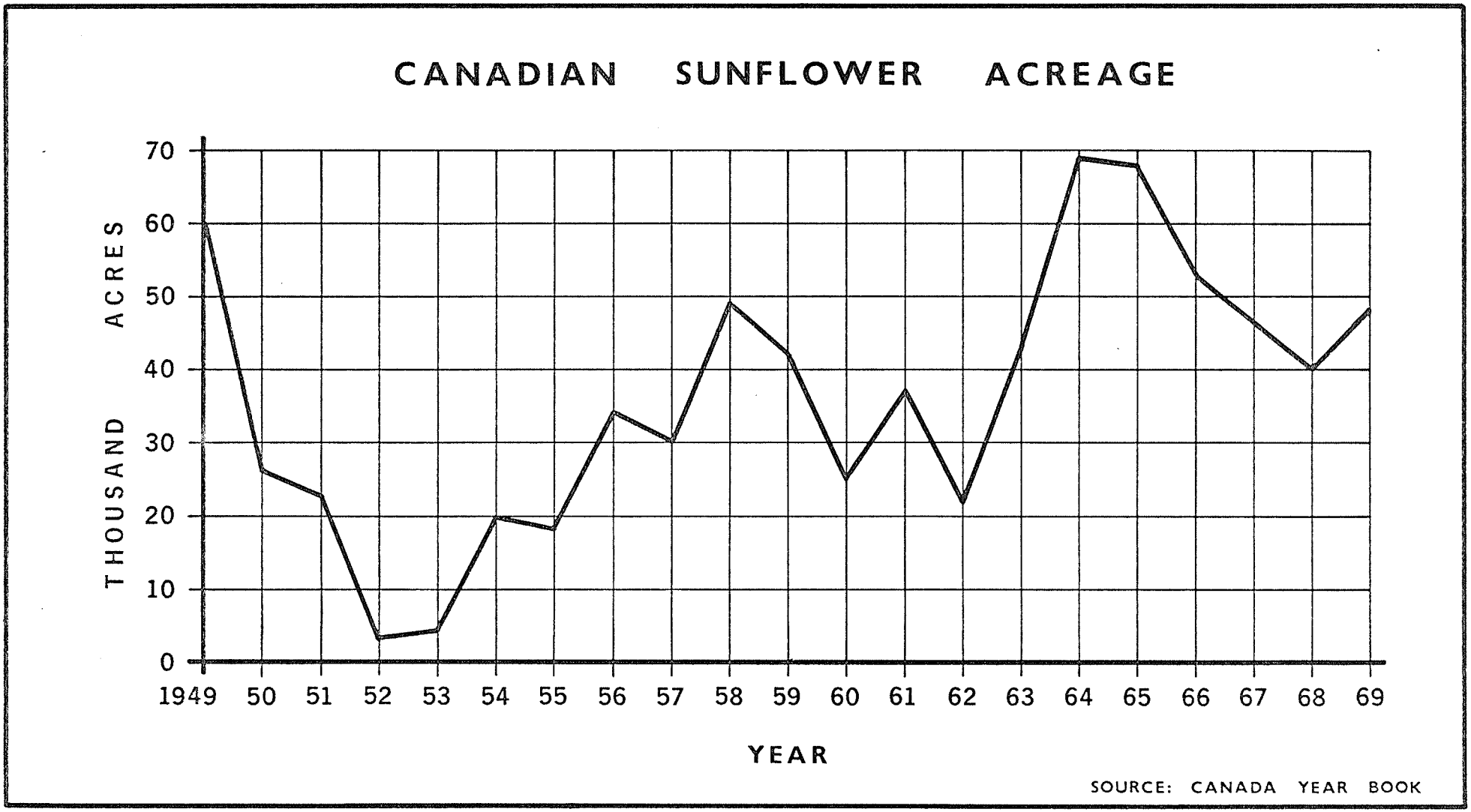
CANADIAN SUNFLOWER ACREAGE
THOUSAND ACRES
70
60
50
40
30
20
10
0
1949 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
YEAR
SOURCE: CANADA YEAR BOOK

FIGURE 8

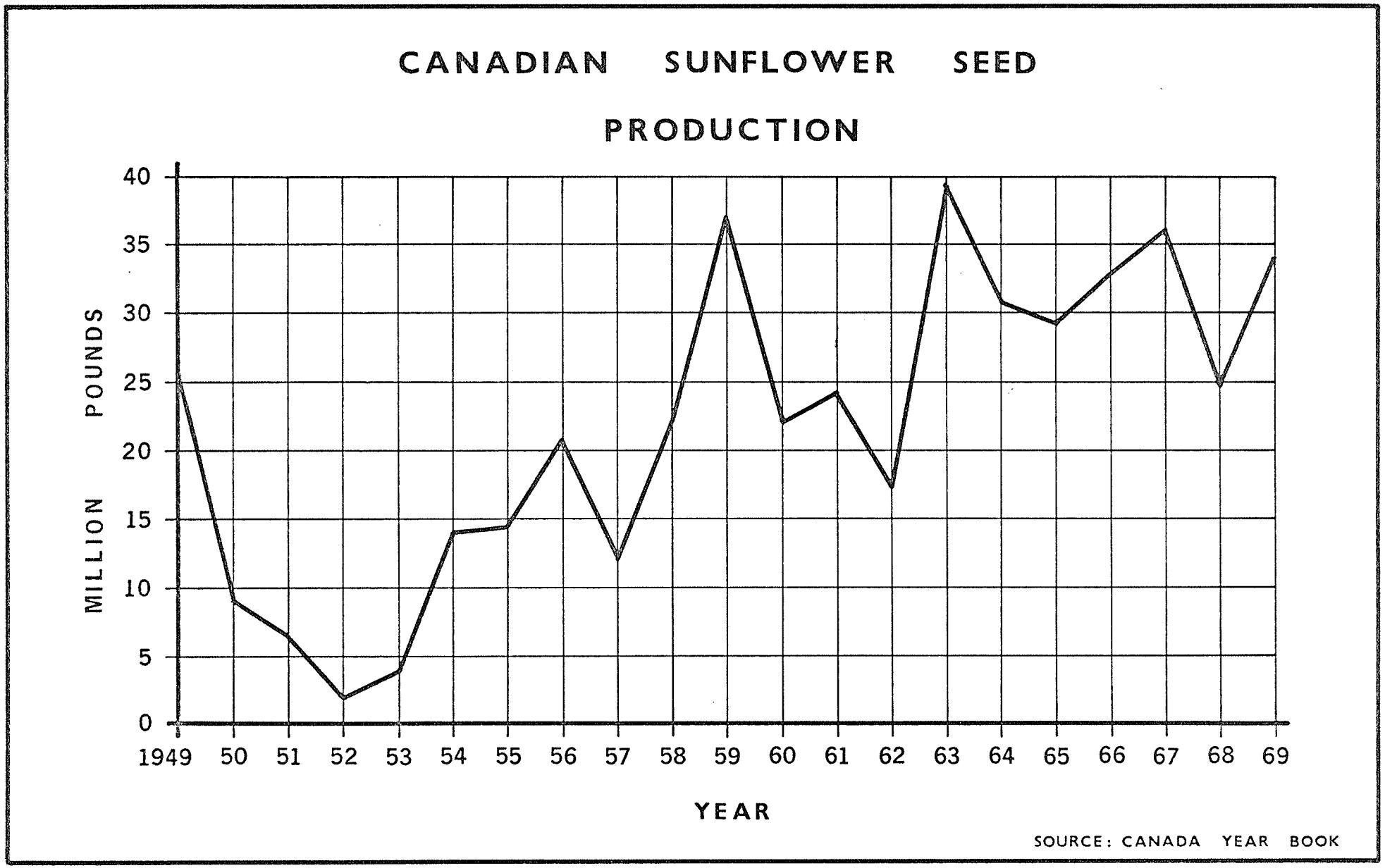
CANADIAN SUNFLOWER SEED
PRODUCTION
MILLION POUNDS
40
35
30
25
20
15
10
5
0
1949 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
YEAR
SOURCE: CANADA YEAR BOOK

FIGURE 9

production is, however, confined to the three Prairie Provinces of Manitoba, Saskatchewan and Alberta with Manitoba consistently surpassing by a significant amount all other provinces in both acreage and production. In fact, for the years 1946 to 1957, Manitoba produced 100 percent of the national total.

According to the 1966 census figures, acreage in the Maritimes was registered only in Nova Scotia and New Brunswick. In Nova Scotia only one farm reported this crop, with 25 acres.[16] In New Brunswick more farms were reported growing sunflowers although the total acreage was considerably less - five farms having a combined total of three acres.

The Quebec acreage is also limited, with eight farms having a total acreage of 96.[17] The major part of this acreage is located along the south shore of the St. Lawrence from the Montreal area to Three Rivers in the counties of Chateauquay and Nicolet.[18]

The Ontario sunflower acreage is the largest outside of the Prairie Provinces, with 84 farms reporting 2,639 acres.[19] The bulk of the acreage is concentrated in Southern Ontario in the counties of Huron, Kent and Essex.[20]

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[16] *Census of Canada, 1966, Agriculture*, Dominion Bureau of Statistics (Ottawa: Queen's Printer).

[17] *Ibid.*

[18] *Ibid.*

[19] *Ibid.*

[20] *Ibid.*

The seed is grown for birdseed, as a forage mixture in corn and for the confectionery trade.[21]

The acreage in British Columbia is almost non-existent, with only two acres being indicated in the 1961 census and none in 1966.[22] This acreage is naturally insignificant and is only recorded here as an indication that this crop has been grown in this province.

As mentioned previously, the Canadian sunflower acreage is mainly located in the Prairie Provinces. There have, however, been wide fluctuations in seeded acreage in all three provinces, with a stabilized acreage being evident only in Manitoba. Brief descriptions of the Alberta and Saskatchewan acreage will precede a detailed study of Manitoba's in Chapter IV.

Alberta's acreage is mainly concentrated on a line from Calgary to Edmonton and east to the Saskatchewan border between latitudes 51 and 53 degrees north.[23] The acreage is small with 24 farms reporting 3,248 acres for 1966 although in at least one year, 1959, the acreage has been as high as 17,000 (Table IV).[24]

The acreage allocated to sunflowers in Saskatchewan at five year intervals from 1946 to 1966 is shown in

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[21] Personal correspondence between Prof. G.E. Jones, University of Guelph, Guelph, Ontario and the writer, August 23, 1968.

[22] *Census of Canada, 1961, Agriculture*, Dominion Bureau of Statistics (Ottawa: Queen's Printer); also *Census of Canada, 1966*.

[23] *Ibid.*

[24] *Ibid.*

TABLE IV

Production of Sunflower Seed in Alberta 1958 to 1966

Year	Acreage	Yield per Acre	Production
		pounds	
1958	3,700	750	2,775
1959	17,000	1,000	17,000
1960	6,500	1,050	6,800
1961	3,400	811	2,757
1962	2,500	800	2,000
1963	1,500	1,025	1,538
1964	7,500	300	2,250
1965	3,500	100	350
1966	3,200	450	1,440

Source: Personal correspondence between K. Elgaard, Assistant Director, Alberta Department of Agriculture, Economics Division, Edmonton, Alberta and the writer, August 21, 1968.

Table V. The acreages are also given for 1967 and 1968 but these are estimates. Although higher acreages could have existed in the intervening years, the data indicates that, along with extremely wide variations, the total acreage has never been substantial. In support of this contention, it is the small acreages that have made it difficult to obtain yearly figures.

The average yields in Saskatchewan for 1966 and 1967 are 500 and 450 lbs/acre respectively.[25] These low yields are believed to have resulted from late seeding. In 1966 the sunflowers were located in the more southerly portion of the province from Saskatoon to the International Boundary with the acreage dispersion being rather even.[26]

Therefore sunflowers in Saskatchewan have been in a very minor position for a considerable time and appearances suggest a continuance of this trend. It is possible, however, that earlier maturing varieties may contribute to an increased acreage.

In summary, sunflowers at present are insignificant in all areas beyond the Prairie Provinces and in all probability this trend will continue for some time. Within the Prairie Provinces the sunflower acreage of Alberta and

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[25] Personal correspondence between E.H. Evans, Supervisor of Statistics, Province of Saskatchewan, Department of Agriculture, Economics and Statistics Branch, Regina and writer, August 22, 1968.

[26] *Census of Canada, 1966, op. cit.*

TABLE V

Saskatchewan Acreages

Year	Acreage
1946	930
1951	18
1956	814
1961	2,276
1966	6,700
1967	1,800
1968	2,500

Source: Personal correspondence between E.H. Evans, Supervisor of Statistics, Province of Saskatchewan, Department of Agriculture, Economics and Statistics Branch, Regina and the writer, August 22, 1968.

Saskatchewan is small relative to other crops with no stabilization being evident. The acreage in these two provinces will undoubtedly retain its variable state until some formal large scale promotion scheme is introduced. Production in Manitoba is the largest in Canada and the factors contributing to this position will be dealt with in the following chapter.

CHAPTER IV

SUNFLOWERS IN MANITOBA

Although sunflowers have been grown in Manitoba for almost a century, it was the crisis of World War II which established the crop commercially. With the restoration of peace the crop was able to retain a position in the provincial economy primarily through the location of a processing plant at Altona. It is the purpose of the following pages to trace the development of this industry in Manitoba from its inception to the present.

I. Early History

The history of sunflower growing in Manitoba is almost as old as the province itself. The plant was introduced by Mennonites on their arrival from Russia in the years 1874 and 1875.[1] This migration was the outcome of a decision by the Czar of Russia who in 1870 sought to implement a "... thorough Russianization of all his

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[1] C.A. Dawson, *Group Settlement: Ethnic Communities in Western Canada*, Vol. VII of *Canadian Frontiers of Settlement*, eds. W.A. Mackintosh and W.L.G. Joerg (Toronto: The Macmillan Co., 1936), p. 100.

people."[2]

The Mennonites brought with them the Russian sunflower. They grew it in their gardens on their newly acquired farmlands. When ripe, the seed was roasted, then cracked and eaten out of hand. It was considered a delicacy and consumed entirely within the home.

As early as 1882 it was reported that the sunflower thrived in Manitoba soil, although still limited to gardens.[3] Even then, the value of the plant was recognized. The seeds could be employed as either a poultry feed or as a source of oil, suitable both as a table oil and machinery lubricant; the stalks provided a useful textile fibre and the blossoms contained an excellent dye.[4]

Nevertheless, the sunflower, from its introduction in the middle of the 1870 decade to the beginning of the 1940 decade, was grown only in the gardens of Manitoba. It never progressed to commercial status as there was insufficient demand for any portion of the plant in quantities large enough to sustain a profitable marketing operation.

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[2] Dawson, *op. cit.*, p. 100.

[3] Department of Agriculture and Statistics, *Report of the Department of Agriculture and Statistics of the Province of Manitoba for the Year 1882* (Winnipeg: Queen's Printer, 1883), pp. 41-42.

[4] *Ibid.*

II. Development into a Commercial Crop

With the outbreak of World War II and the subsequent termination of supplies of imported vegetable oils, the Government of Canada, in 1942, approached the Mennonite farmers of south-central Manitoba to grow sunflowers commercially because they were familiar with the plant.[5] Although the initial crops were grown predominantly by farmers of Mennonite background, other farmers soon were involved in sunflower cultivation. The farmers in this region accepted the offer to grow sunflowers for many and varied reasons. An attempt will be made to enumerate those which undoubtedly figured prominently in their decision. The subsequent order does not denote any type of priority.

1. The sunflower was familiar to the Mennonites even though it had only been grown on a garden plot scale in the area. They, therefore, considered themselves acquainted with the cultural requirements for the crop.

2. Sunflowers are a row crop, which means, as the name implies, that the plants are sown in rows which can be intertilled. The farmers in the area had experience with crops in rows since they were growing other row crops such as corn and sugar beets.[6]

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[5] G.E. Britnell and V.C. Fowke, *Canadian Agriculture In War and Peace 1935-50* (Stanford: Stanford University Press, 1962), p. 347.

[6] Robert Meyers, *Spirit of the Post Road* (Altona: D.W. Friesen & Sons Ltd., 1955), p. 107.

3. Row crop production requires special equipment usually in the form of light tractors with attached cultivators to ensure good intertillage. Since they already had this equipment for other row crops no additional expensive machinery was required.

4. The Mennonites, along with many other western Canadian farmers, had experienced a financial crisis during the depression because they had been growing crops, especially wheat, for sale on the world market.[7] When this market collapsed the farmer was unable to sell his grain, resulting in the loss of income. This condition could be alleviated to a great extent if the farmer diversified his operation into other crops and livestock. He would be assured of a market for most of his produce, much of which would be required nationally. Sunflowers, therefore, fit a diversification program as they expanded the variety of crops and they were in demand in Canada.

5. The price was guaranteed at five cents per pound by the Government of Canada prior to seeding.[8] The farmer was therefore able to estimate more accurately the prospective income from his sunflower crop than from other crops. Thus sunflowers contributed to a planned farm economy.

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[7] Meyers, *op. cit.*, p. 18.

[8] Britnell and Fowke, *op. cit.*, p. 347

6. The farms in the municipalities of Rhineland and Stanley, in the core of the Mennonite area, average approximately 210 acres, which is relatively small by western Canadian standards.[9] To be economically viable the farms must be intensively cultivated. Sunflowers suit an intensive farm operation.

7. Sunflowers offer the farmer several benefits from a cultural standpoint. They allow the normal three year crop rotation to be extended by one year. They are an excellent clean-up crop in that sunflowers can be grown while effectively controlling the weeds and volunteer grain between the rows.[10] Finally, sunflowers are harvested later than other crops, thereby distributing the farmer's seasonal work load over a longer period.

8. It has also been suggested that the profits from sugar beets at this time were disappointing, which made the farmers more receptive to other crops such as sunflowers and flaxseed.[11]

The foregoing factors, either individually or in various combinations, prompted farmers to grow sunflowers commercially. After the 1943 crop, talk of building a processing plant was an incentive for others to try some

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[9] Meyers, *op. cit.*, p. 107.

[10] *Ibid.*

[11] E.K. Francis, *In Search of Utopia* (Altona: D.W. Friesen & Sons Ltd., 1955), p. 223.

acreage. Also, although it is difficult to gauge, others believed they were rendering a patriotic obligation as it was wartime and the government required vegetable oils. Regardless, the acreage during the war remained limited and expanded little until the end of the 1940 decade.

III. Acreage and Production

Figure 10 represents the Manitoba sunflower acreage from 1943, when the crop was initially grown on a commercial scale, to 1969. The graph at first appears to display a rather erratic pattern. However, distinct trends become evident on closer examination. From 4,300 acres in 1943 there was in general a regular expansion until 1948, with an all-time record of 60,000 acres being attained in 1949. This accelerating growth was the result of the government's extension of a guaranteed price until 1948, the completion of the Altona processing plant in 1946, and a good market.[12]

From the figure of 60,000 acres in 1949 the crop declined rapidly to only 3,000 in 1952. Several factors caused this decline, the most important of which was a succession of three, low yielding crops. In 1949 heavy rains and high winds occurred just as harvest was commencing. This unusual weather caused severe lodging and reduction of yield and led to smaller acreages in 1950.

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[12] Britnell and Fowke, *op. cit.*, p. 349

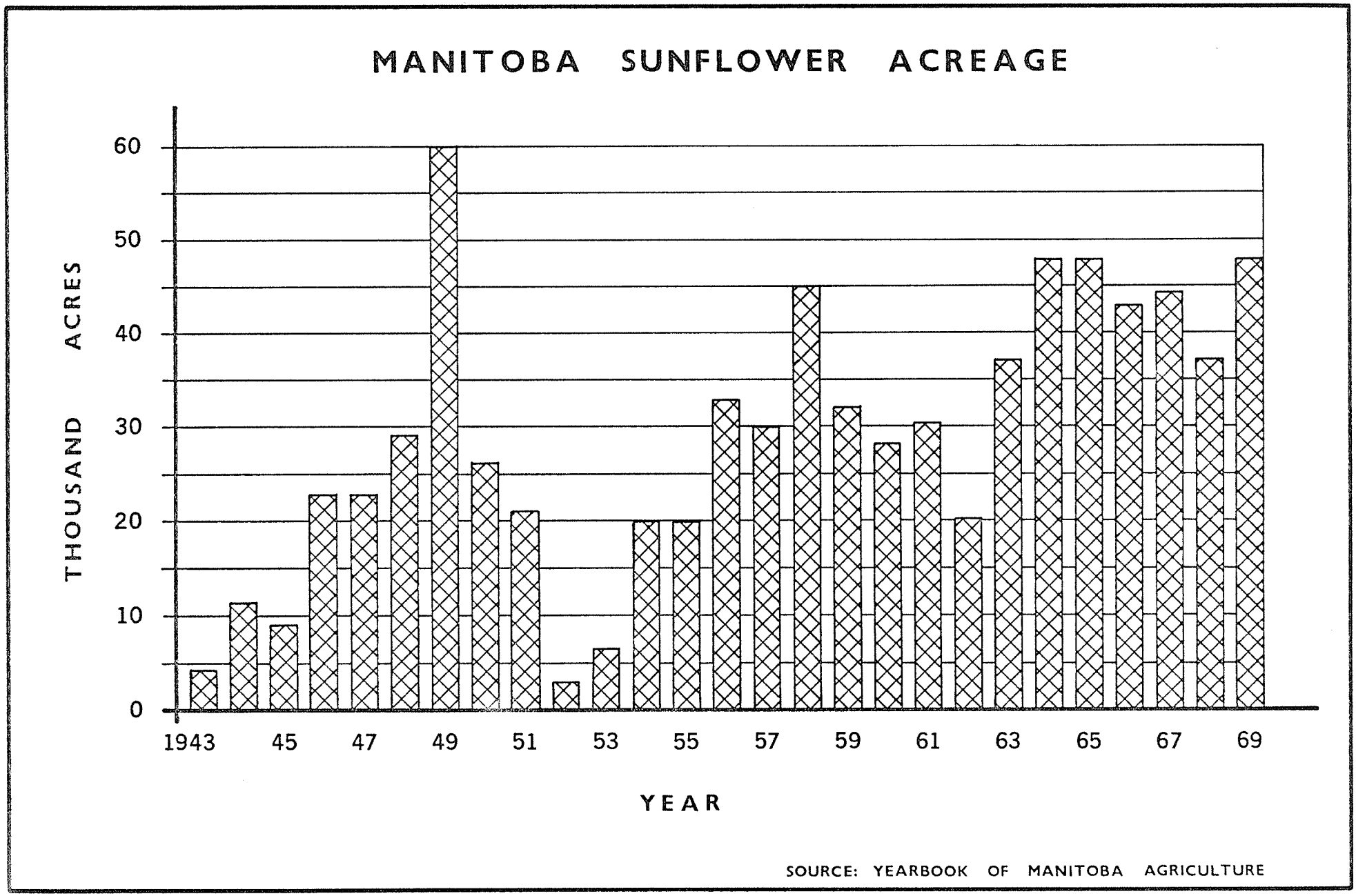
MANITOBA SUNFLOWER ACREAGE
THOUSAND ACRES
60
50
40
30
20
10
0
1943
45
47
49
51
53
55
57
59
61
63
65
67
69
YEAR
SOURCE: YEARBOOK OF MANITOBA AGRICULTURE

FIGURE 10

The yield in 1950 was low and the seed was immature and consequently, of poor quality, due to late seeding caused by the exceptional weather associated with the famous Red River flood of that year. These circumstances precipitated a further decline in acreage in 1951.[13] Also in 1951 a severe rust infestation, attributed to over-planting, resulted in a low-yielding, poor quality crop.[14] The low quality seed of 1950 and 1951 prevented prices equivalent to those of previous years.

The situation was further aggravated by lower prices for vegetable oils in the world markets, which contributed to increased competition from imported oils such as Argentine sunflower oil and cottonseed and soybean oils from the United States.[15] The all-time low of 3,000 acres in 1952 and the small acreage of 1953 reflects the farmer's hesitation about planting sunflowers in view of the "hard-luck" this crop has experienced in the preceding years.

The acreage since 1953 has increased gradually, levelling off in the vicinity of 45,000. This expansion is ascribed to better cultural practices, improved varieties with rust resistance, price stability and

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[13] Personal correspondence between Dr. E.D. Putt, Director, Research Station, Canada Department of Agriculture, Morden and the writer, April 25, 1972.

[14] Meyers, *op. cit.*, p. 122.

[15] Britnell and Fowke, *op. cit.*, p. 348.

continuing market demand. The periodic recessions in acreage are due to the vagaries of weather such as excessive precipitation, early frost and drought which discourage the more inexperienced growers.

Figure 11 illustrates the sunflower seed production obtained from the acreage in Figure 10. As may be expected there is a high positive correlation between the two figures. Where disparities exist between the acreage and production, as in 1964, they are most often associated with the weather which prevents the seeds maturing fully or causes such poor fall conditions that losses occur during harvest.

The acreage and production have therefore experienced peaks and recessions since sunflowers became a commercial crop. Apart from the small acreage in 1952 which followed three successive years of low returns, the crop has had considerable success since its inception and appears entrenched in the provincial economy with an approximate acreage of 45,000 and a production of 30 million pounds per year.

IV. Present Location of Sunflower Acreage in Manitoba

Figure 12 depicts the location of the sunflower acreage in Manitoba. The total acreage represented is approximately 43,000 with one dot symbolizing 80 acres.

The method employed in constructing this map was

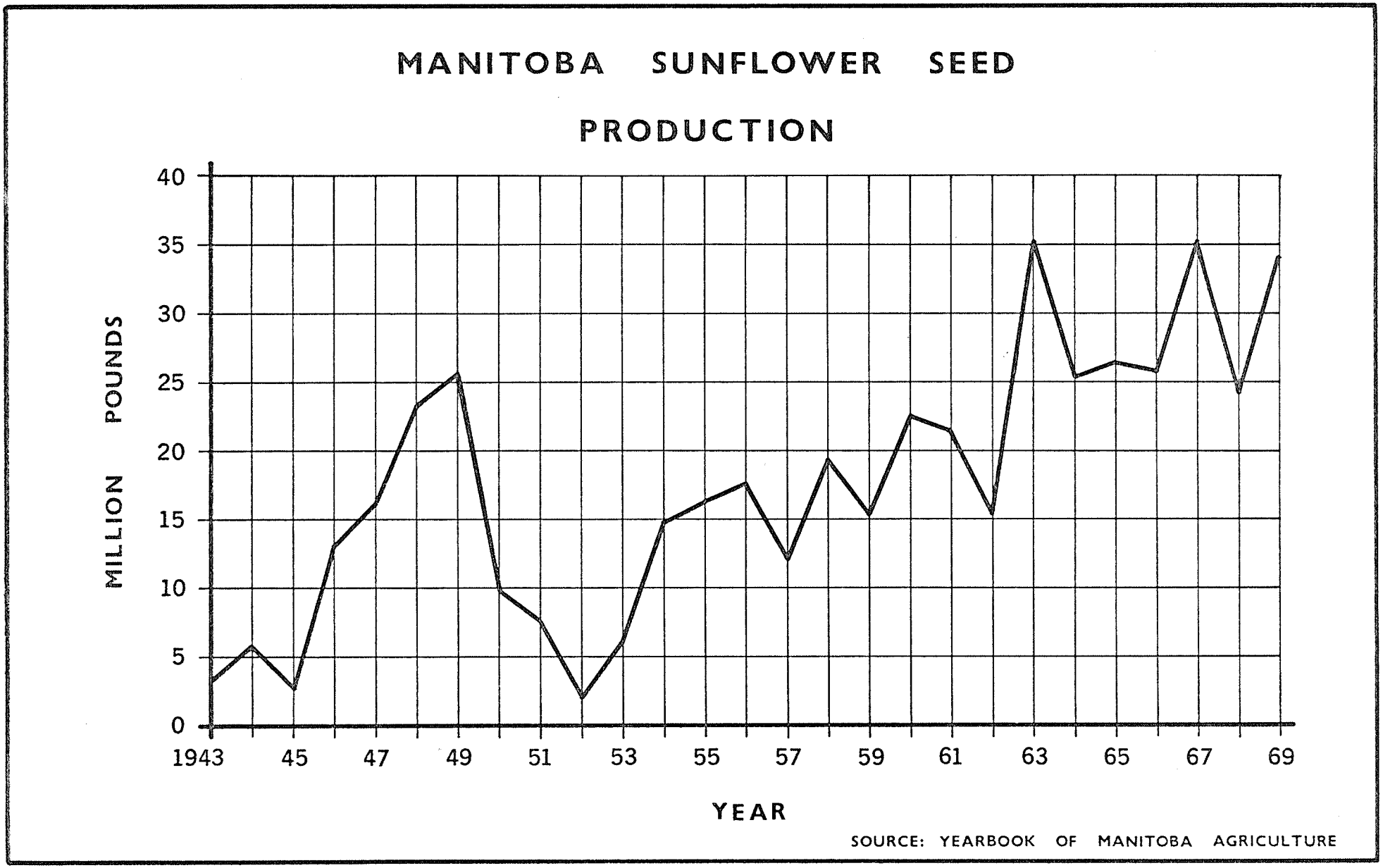

MANITOBA SUNFLOWER SEED
PRODUCTION
MILLION POUNDS
40
35
30
25
20
15
10
5
0
1943
45
47
49
51
53
55
57
59
61
63
65
67
69
YEAR
SOURCE: YEARBOOK OF MANITOBA AGRICULTURE

FIGURE 11

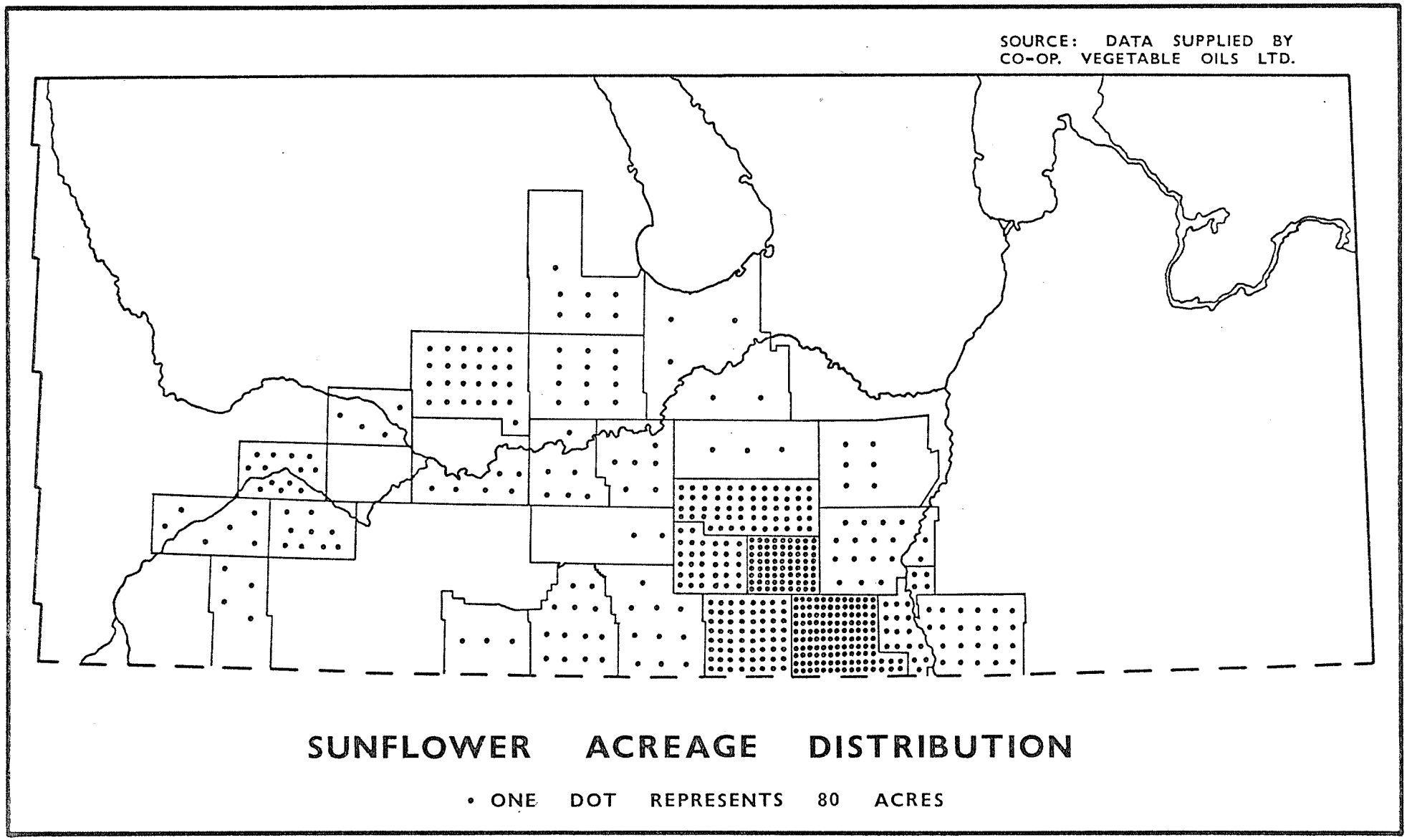

SOURCE: DATA SUPPLIED BY
CO-OP. VEGETABLE OILS LTD.
SUNFLOWER ACREAGE DISTRIBUTION
• ONE DOT REPRESENTS 80 ACRES

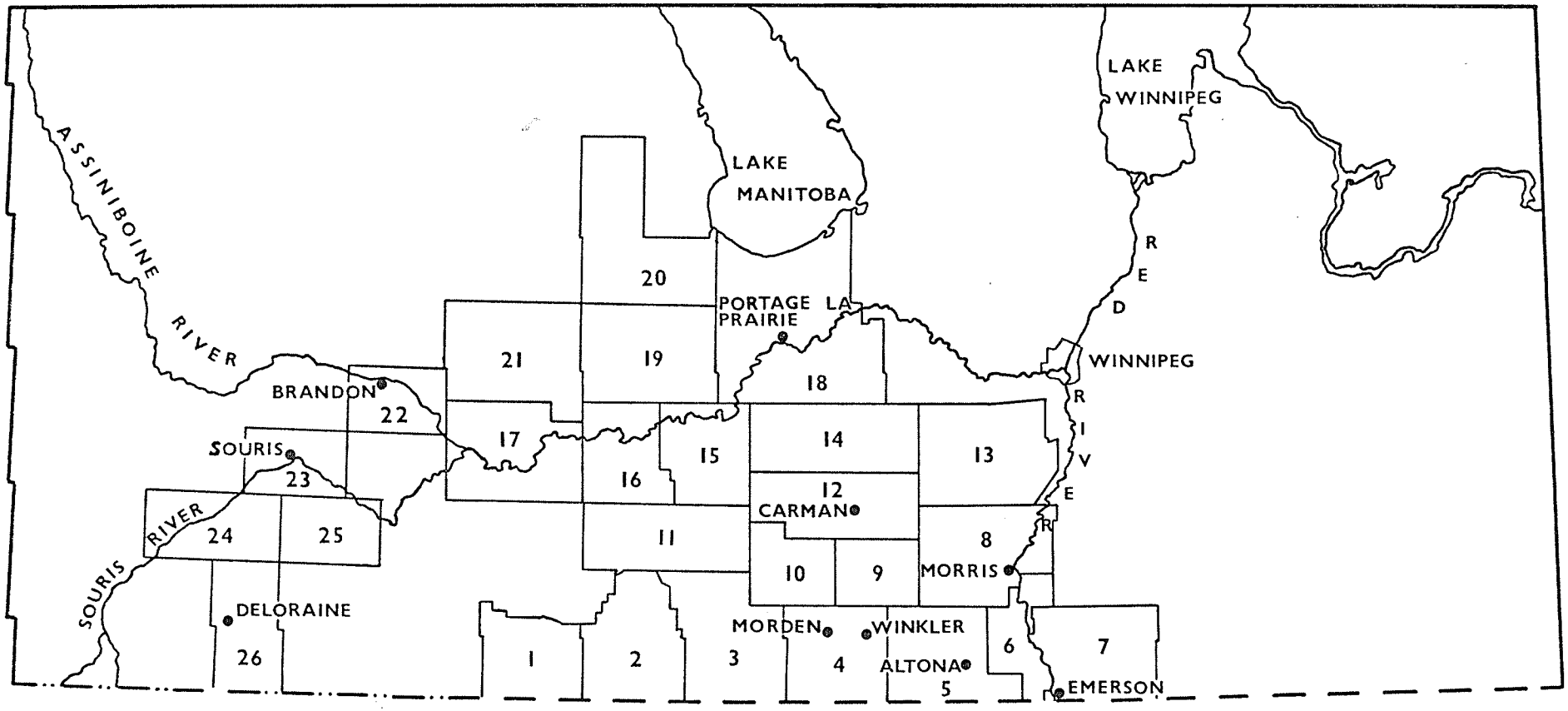
FIGURE 12

based on information supplied by the processor, Co-op. Vegetable Oils Ltd. of Altona, hereafter referred to as CVO, for a three-year period. By utilizing the postal address, in most cases a town, of each sunflower grower contracting to CVO, and the amount of his acreage for 1967 and 1968, the total acreage within each individual municipality was ascertained by adding the acreages from all the towns within that municipality. Where a town was located on a boundary between two municipalities the acreage assigned to that town was equally divided between them. Figures giving the acreages by municipality were used for 1969. The three sets of figures were then averaged for each municipality.

A dot method was then administered. In small municipalities with a high acreage, the dots were placed at regular intervals. In other municipalities, where the information allowed, the dots were placed as near as possible on the actual site of the acreage. This technique made it possible to determine both the outer limits of the sunflower acreages and those municipalities with the highest densities.

Figure 13 identifies and delimits the municipalities incorporated within the growing region. When Figures 12 and 13 are compared one observes that the five coterminous muncipalities of Rhineland, Stanley, Roland, Thompson and Dufferin have the highest density and can therefore be

MUNICIPALITIES POSSESSING SUNFLOWER ACREAGES



MUNICIPALITIES

1- ROBLIN
2- LOUISE
3- PEMBINA
4- STANLEY
5- RHINELAND
6- MONTCALM
7- FRANKLIN
8- MORRIS
9- ROLAND
10- THOMPSON
11- LORNE
12- DUFFERIN
13- MACDONALD
14- GREY
15- SOUTH NORFOLK
16- VICTORIA
17- SOUTH CYPRESS
18- PORTAGE LA PRAIRIE
19- NORTH NORFOLK
20- WESTBOURNE
21- NORTH CYPRESS
22- CORNWALLIS
23- GLENWOOD
24- CAMERON
25- WHITEWATER
26- WINCHESTER

FIGURE 13

designated the "core area" of the sunflower growing region. These five municipalities of the twenty-six growing sunflowers contain approximately 65 percent of the total Manitoba acreage. There are 3,210 farms with an average size of 304 acres in the five municipalities of the core area, although there is considerable range of farm size.[16] The area is intensively cultivated with almost all land being tilled.

The first plantings were in Rhineland and Stanley municipalities and over the last 25 years have spread outward. It would appear that the outer limits of the growing region are fairly well established west of the Red River. The boundaries of this region are slightly beyond the Assiniboine River on the north; the Souris River on the west; the International Border on the south and the Red River on the east. In 1971, 4,800 acres were contracted east of the Red River, particularly in the municipality of Franklin, but it is rather doubtful that this eastward trend of the last years will continue beyond its present extent.

V. Reasons for Constructing a Processing Plant in Manitoba

Almost as soon as the Government of Canada announced

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[16] L.R. Rigaux, *Economic Aspects of Sunflower Production in Manitoba*, Faculty of Agriculture and Home Economics, Research Report No. 6, March, 1960 (Winnipeg: University of Manitoba, 1960), p. 7.

its intention of increasing the acreage of oil-bearing seeds and that a sunflower program was being initiated in southern Manitoba, some farmers in the Altona region voiced their opinion that a local processing plant would be desirable.[17] Mr. J.J. Siemens of Altona was a leading advocate for the plant. Since he was a driving force behind the co-operative movement in western Canada he was able to substantiate to many in the community the advantages of a locally-owned enterprise.[18] Although there was considerable indecision in government circles on the requirements for a complete sunflower program, a fact which contributed to the small Manitoba acreage in 1943, a number of meetings were held in the Altona area in the early part of the same year to discuss the notion of constructing a local processing plant.[19] These gatherings sought to acquaint the residents with the problems involved in undertaking such a venture by themselves and to assess the financial soundness of the project.

On August 7, 1943 the Mennonite Agricultural Advisory Committee, a group formed to deal with agricultural problems in the Mennonite area, delegated five men to obtain certain information on building a plant.[20] The objectives of their inquiry were: to ascertain the cost of constructing a processing plant; to determine the most

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[17] *The Altona Echo*, April 19, 1944, p. 1.

[18] Meyers, *op. cit.*, p. 109.

[19] *The Altona Echo*, April 4, 1943, p. 1; April 19, 1944, p. 1.

[20] Meyers, *op. cit.*, p. 109.

economical method of oil extraction, to decide the type of machinery required and to assess the financial arrangements needed.[21] The information was presented to a meeting on September 11, 1943 and a provisional board of directors for CVO was elected.[22]

It was then decided to proceed with the plant construction although doubts assailed some of the local farmers. It appears that a combination of factors were responsible for this progressive decision among which the following are important.

1. The initial estimate of constructing a plant was $30,000.[23] In view of past accomplishments of co-operative movements in the area, this amount did not appear too difficult to raise. Even though this figure turned out to be a most conservative estimate and was revised to $75,000 within a few months, it still did not seem insurmountable.[24]

2. The members of the Altona district wished to process locally any crop of which they were the major supplier, thereby retaining a greater percentage of the profits within the region. Some members of the community harbored the notion that they had failed to obtain the sugar beet

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[21] Meyers, *op. cit.*, pp. 109-110.

[22] *The Altona Echo*, April 19, 1944, p. 1.

[23] *Ibid.*, p. 5.

[24] *Ibid.*

processing plant which had located in Winnipeg, a procedure they did not want repeated.[25] They believed that since their area grew the largest proportion of sugar beets in Manitoba, profits were being lost by shipping them to Winnipeg for processing. In actuality, however, it is extremely doubtful that a sugar beet processing plant could have located in the region because of the limited water supply.

3. The only plant capable of processing sunflower seeds was located in eastern Ontario, about 1,500 miles away. This meant that meal, the principal by-product of the oil extraction process, was being lost to the farmers of Manitoba due to the high cost of return shipment to the province. Therefore, if the meal, which is very high in protein and an excellent feed for farm animals, could be produced locally, it would provide a nutritious feed at a reasonable price in a diversified farm region.[26]

4. A number of men from the community were in the armed services at this time. When they returned at the end of the war, it was hoped that many would be persuaded to stay in the district if small acreage farms could be made productive since no more vacant land was available for expansion.[27] By building a plant, the future cultivation

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[25] Francis, *op. cit.*, p. 228.

[26] E.D. Putt, *Sunflower Seed Production* (Rev. ed.; Altona: Co-op. Vegetable Oils Ltd., 1952), p. 26.

[27] *The Altona Echo*, April 19, 1944, p. 5.

of sunflowers would be assured and the economic preservation of the small farm enhanced.

5. Decentralization of industry was desirable from both a rural and provincial standpoint. The provincial economy would be placed on a broader base, thereby contributing to a more equitable distribution of money and people. From a rural point of view a new industry would promote growth and diversity in a town.

6. As mentioned previously the Government of Canada had guaranteed a price of five cents a pound top grade on sunflower seed, f.o.b. the grower's shipping point. The Canadian Wheat Board, as the Government's agent for sunflower seed, sold the seed at the same five cent price to the processor in Ontario i.e. f.o.b. the buyer's receiving point.[28] The "... liability for all freight, storage, cleaning, conditioning, handling, interest and administration costs incurred by the Board" were absorbed by the Government.[29] This arrangement on sunflower seed was continued for the four years from 1943 to 1946 and with revisions extended to 1948.[30] Manitoba growers realized that such wartime arrangements would undoubtedly be discontinued when peace was restored. This would possibly affect the grower's

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[28] Britnell and Fowke, *op. cit.*, p. 349.

[29] *Ibid.*

[30] *Ibid.*

price adversely and lead to an unrealistic consumer price as the seed of varieties grown at the time contained 50 percent hull or waste material, which is expensive to transport over long distances.[31]

To summarize, all these factors in varying degrees of importance played a role in persuading the directors and members to proceed with the plant construction.

VI. Plant Location

On the surface it made little difference where the plant was located in the community, a region with artificial boundaries within the municipalities of Rhineland and Stanley and focussing on the towns of Winkler, Altona and Plum Coulee. Although natural prejudices were felt for particular towns, it was suggested that the proposed plant should be regarded as a benefit to the whole region rather than to an individual town.[32]

Regardless of such a congenial approach to the situation, certain factors were fundamental to locating any plant. A central position to the envisaged acreage was practical so that hauling of the seed by the growers would be as equitable as possible.[33] The site should have transportation facilities in the form of rail and all-

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[31] Putt, *op. cit.*, p. 25.

[32] *The Altona Echo*, March 15, 1944, p. 2.

[33] *Ibid.*, February 23, 1944, p. 2.

weather roads. Water, a vital necessity to most industries and particularly the processing of sunflowers, should be available for immediate requirements with a reserve potential should expansion take place. Of secondary importance is sufficient supply of personnel to operate the plant, and the availability of suitable accommodation in housing.[34]

The shareholders met in April of 1944 and decided to locate the new processing plant in Altona.[35] Although it met most of the locational requirements, it was deficient in the basic necessity, water. It did not have its own supply, a condition which was not rectified until 1961.[36] Therefore, even though another site, Winkler, would have been more desirable, the question arises as to why the preference was given to Altona.

Actually if the Altona site had not been accepted, in all probability the plant would not have become a reality. The reasons for this supposed lack of economic consideration were the leading men proposing the plant. Mr. D.K. Friesen and Mr. J.J. Siemens, both from Altona, had spent so much time in fostering the approval of a processing plant that any site other than Altona was out of the question.[37]

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[34] *The Altona Echo*, February 23, 1944, p. 2.

[35] Meyers, *op. cit.*, p. 113.

[36] Co-op. Vegetable Oils Ltd., *Eighteenth Annual Report 1960-1961* (Altona, 1961), p. 10.

[37] Statement by D.K. Friesen, personal interview, August 27, 1968.

VII. Plant Construction and Subsequent Growth

Even prior to the final agreement on the plant site, initial steps had been implemented to have the plant operative as soon as possible. However, many delays arose which deferred completion for several years. The postponement is readily understood when viewed in the context of the times as no other plant of this type had ever been built in Canada and little information was available to the directors upon which to model their plant. Further, because of the war, acquiring and shipping machinery was a slow process.

To finance the venture, shares were sold throughout the district. By the time the plant commenced operations in 1946, some 800 people had become shareholders.[38] As the construction costs of the plant continued to rise, further capital was obtained by selling debentures.[39] Bonds were also sold and guaranteed by the provincial government.[40] Local sister co-operatives were also generous in lending funds.[41] The extent of local support in the community is evident from the fact that $100,000 was raised within a ten mile radius of Altona.[42]

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[38] Francis, *op. cit.*, p. 228.

[39] *The Altona Echo*, April 19, 1944, p. 5.

[40] Meyers, *op. cit.*, p. 118.

[41] *Ibid.*

[42] *Ibid.*

At the end of March 1944, the President, Mr. P. Brown and Director, Mr. J.J. Siemens of CVO journeyed to Cleveland, Ohio to finalize the purchase of plant machinery with the supplier, the V.D. Anderson Company.[43] From Cleveland the two men travelled to Washington, D.C. and Ottawa to arrange priorities for the release and shipment of the equipment from the United States to Canada.[44] The priority for the equipment was assured by the Government of Canada as no oil extracting plants specializing in the processing of sunflower seed were in operation in Canada.[45] The plant in Hamilton, Ontario to which the Manitoba sunflower seed was destined was primarily designed for flax and although it was able to process both sunflowers and soybeans the change-over was uneconomical because of the small amount of seed available.[46] Special priorities had also been given by the Government of Canada for an oil processing plant at Moose Jaw, Saskatchewan and another in Alberta, reportedly at Lethbridge.[47] However, both the Government of Canada and the Government of Manitoba promised that no further concessions would be extended to any other organization for an oil processing plant in

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[43] *The Altona Echo*, April 19, 1944, p. 1.

[44] *Ibid.*, April 5, 1944, p. 1

[45] *Ibid.*, April 19, 1944, p. 5.

[46] *Ibid.*

[47] *Ibid.*, p. 1.

Manitoba.[48]

The response obtained by Mr. Brown and Mr. Siemens on their trip was so gratifying that it prompted the belief that the Altona plant would be in operation by October 1944 to process the 1944 crop.[49] This optimism also fostered the suggestion that the sunflower seed stored at the Lakehead from the 1943 crop should be returned to Altona for processing.[50]

The first steps in constructing the plant were taken in April and May of 1944 with the purchase of five and one-half acres as a site on the C.P.R. right-of-way within the town limits of Altona.[51] At the same time a pond was formed to act as a reservoir for the water requirements of the plant.

After this promising start it became apparent that the equipment from the V.D. Anderson Company would be delayed for some time. It was during this period that the Government of Manitoba recommended that considerable machinery could be salvaged and utilized from a plant being dismantled at Stratford, Ontario.[52] Since substantial savings appeared possible, CVO, in June 1944, purchased a large portion of the machinery.[53] When this machinery

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[48] *The Altona Echo*, April 19, 1944, p. 5.

[49] *Ibid.*, April 5, 1944, p. 1.

[50] *Ibid.*

[51] *Ibid.*, May 17, 1944, p. 1.

[52] Meyers, *op. cit.*, p. 114.

[53] *The Altona Echo*, June 7, 1944, p. 1.

ultimately arrived at Altona, it was found to be excessively worn, thereby eliminating any possibility of it being used in the new plant.[54] Consequently, what had been a venture to save money became instead a direct loss of $15,000.[55]

In the spring of 1945, actual construction began and by July some of the new machinery from the Anderson Company arrived.[56] On March 5, 1946 the final shipment of machinery was received and immediately installed.[57] On March 7, the plant officially commenced operations and within a week a tank car of oil and the first carload of meal were shipped.[58] The total cost to bring the plant into operation at this stage was $155,000.[59]

At the first annual meeting, held September 19, 1947, it was reported that the primary year of production had been a success.[60] From this initial encouraging appraisal the plant began to improve its operations, a process which has continued to the present day. To illustrate the progressive spirit and the physical and financial expansion

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[54] Meyers, *op. cit.*, p. 114.

[55] *Ibid.*, p. 115.

[56] *The Altona Echo*, July 18, 1945, p. 1.

[57] *Ibid.*, March 6, 1946, p. 1.

[58] *The Red River Valley Echo* [Altona], June 18, 1958, p. 10; see also *The Altona Echo*, March 13, 1946, p. 1.

[59] *The Altona Echo*, March 28, 1946, p. 3.

[60] *Ibid.*, September 24, 1947, p. 1.

of the company a review of the major steps in growth will be undertaken.

By 1947 and 1949, new expellers were purchased, which increased the production of both oil and meal.[61] Also in 1949 a new concrete elevator, 110 feet high, was constructed "... to receive, clean and dry seed faster."[62] In the same year a Pres-to-log machine was installed, which compressed the hulls of the sunflower seed into logs for use in stoves, furnaces and fireplaces.

In 1953, a new dimension in the processing operation was introduced through the addition of a refinery.[63] This meant that CVO handled not only the bulk or crude oil but also the final product which is sold to the household consumer.

The deodorizer capacity in the refining operation was doubled in 1954.[64] Consequently a greater volume of oil in the refined form was available for sale. Since refined oil has a greater market stability than crude oil the plant operation was now "... not quite so vulnerable to price change."[65] At the same time the oil storage capacity was increased.

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[61] *Eighteenth Annual Report*, *op. cit.*, p. 4.

[62] *Red River Valley Echo*, June 18, 1958, p. 10.

[63] *Eighteenth Annual Report*, *op. cit.*, p. 4.

[64] Co-op. Vegetable Oils Ltd., *Twelfth Annual Report 1955* (Altona, 1955), p. 6.

[65] *Ibid.*

A most significant step was taken in 1957 and 1958 when a conversion was made in the oil extraction process. The previous expeller method was superseded by a more efficient solvent procedure which reduced the oil content in the meal from four percent to one percent, thereby making the operation more efficient.[66] The cost for this conversion was $275,000.[67]

New equipment was installed in 1966 to bring the total capacity of the plant to over 200 tons per day or twice the previous volume.[68] These improvements, costing $360,000, were designed to maintain "... diversity, continuity and stability in seed crushing and market operation."[69]

These, then, are some of the major alterations that have taken place over the last 20 years. All improvements have been implemented to increase the production capacity of the plant and create a more efficient organization. Although the plant was constructed to process sunflowers, the decline in volume of this crop from 1949 to 1952 made necessary a search to locate other crops for crushing. Soybeans from the United States and locally grown rapeseed

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[66] *Red River Valley Echo*, June 18, 1958, p. 1.

[67] *Ibid.*

[68] Co-op. Vegetable Oils Ltd., *24th Annual Report 1967* (Altona, 1967), p. 4.

[69] Co-op. Vegetable Oils Ltd., *21st Annual Report 1964* (Altona, 1964), p. 16.

were found to be suitable. These crops not only saved the company from bankruptcy but have since contributed to diversity in the total operation.

The firm today is a sound business enterprise with assets over two million dollars.[70] It has a solid financial base with a strong monetary reserve accumulated during successful years of operations. As of July 31, 1968, over one million dollars in dividends have been distributed among shareholders, the major portion of which has been in the form of equity and credited to their accounts.[71] CVO has given grants to local charities, to other co-operatives and for research. It has a permanent staff of approximately 40, many with 10, 15 and 20 years of service and also employs considerable seasonal help. CVO is therefore a good example of a successful rural industry and illustrates the assets which accrue to the local community.

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[70] Co-op. Vegetable Oils Ltd., *25th Annual Report 1968* (Altona, 1968), p. 16.

[71] *Ibid.*, p. 15.

CHAPTER V

PHYSICAL FACTORS

The physical factors dictate both the type of crop and its quality that may be grown in any region. The major physical factors involved include climate, soils, drainage and topography. Although all these factors are important, climate and soils are undoubtedly in the forefront since drainage and topography can frequently be altered to some degree.

This chapter will analyze the physical environment of the sunflower growing region of Manitoba to determine whether it is conducive to optimum growth. The problem in such a pursuit is that sunflowers are widely adapted and, consequently, have been grown successfully under many different regimes of soil, precipitation and temperature. This wide adaption makes it difficult to define the ideal conditions clearly. However certain physical requirements for optimum growth have been attached to sunflowers which make the examination of the Manitoba environment expedient.

I. Climate

Although many factors are involved, it is an accepted

premise that temperature, water supply and light are the major ones responsible for plant growth.[1] Each of these factors will be examined separately and the degree to which it is operative within the growing region assessed.

A. Temperature

Temperature influences the growth of plants in a number of ways. Two of the more prominent are the frost-free season and the heat available during the growing season.

(i) Frost-Free Season

This is the average number of consecutive days above 32 degrees F. or 0 degrees C. in a year as determined from the average date of the last spring frost to the average date of the first fall frost.[2] It is also known as the growing season and with respect to sunflowers the longer this season is, the greater will be the leaf surface and the higher the yield.[3]

The recommended ideal growing season for sunflowers is in excess of 150 frost-free days.[4] However, where this

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[1] Thomas R. Weir (ed.), *Economic Atlas of Manitoba* (Winnipeg: Department of Industry and Commerce, 1960), p. 16.

[2] Neville V. Scarfe, George S. Tomkins and Doreen Margaret Tomkins, *A New Geography of Canada* (Toronto: W.J. Gage Limited, 1963), p. 8.

[3] Statement by Dr. E. Putt, Director, Research Station, Canada Department of Agriculture, Morden, personal communication, August 27, 1968.

[4] Statement by Dr. E.D. Putt, personal interview, August 27, 1968.

condition is met in Canada and the United States other factors become operative which tend to limit sunflower acreages. These are agricultural economics which dictate that only the more profitable crops and those with smaller temperature tolerances will be grown in areas having long frost-free seasons. In the Canadian Prairies, some authorities hold to the view that a minimum of 120 frost-free days are necessary to ensure a sunflower becoming fully mature.[5]

Figure 14 depicts the frost-free season in southern Manitoba along with the heaviest acreage concentration and the limits of sunflower production as determined in Figure 12. Observe that the high acreage density is focussed upon the 120-day frost-free line near the International Boundary. The remaining acreage is located where the frost-free season is over 100 days. In other areas where the season is over 110 days but sunflowers are not grown e.g. north of the Assiniboine River, factors such as hauling distance to the Altona processing plant and unsuitable soils become operative.

To summarize, all sunflower acreage is located where the frost-free season is over 100 days, with the heaviest acreage converging toward the 110 and 120-day frost-free lines. Therefore, although this is considerably below the

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[5] David Wreford, "Keep a Weather Eye on Two 'Bad Times' Crops," *Good Farming*, April, 1968, p. 41.

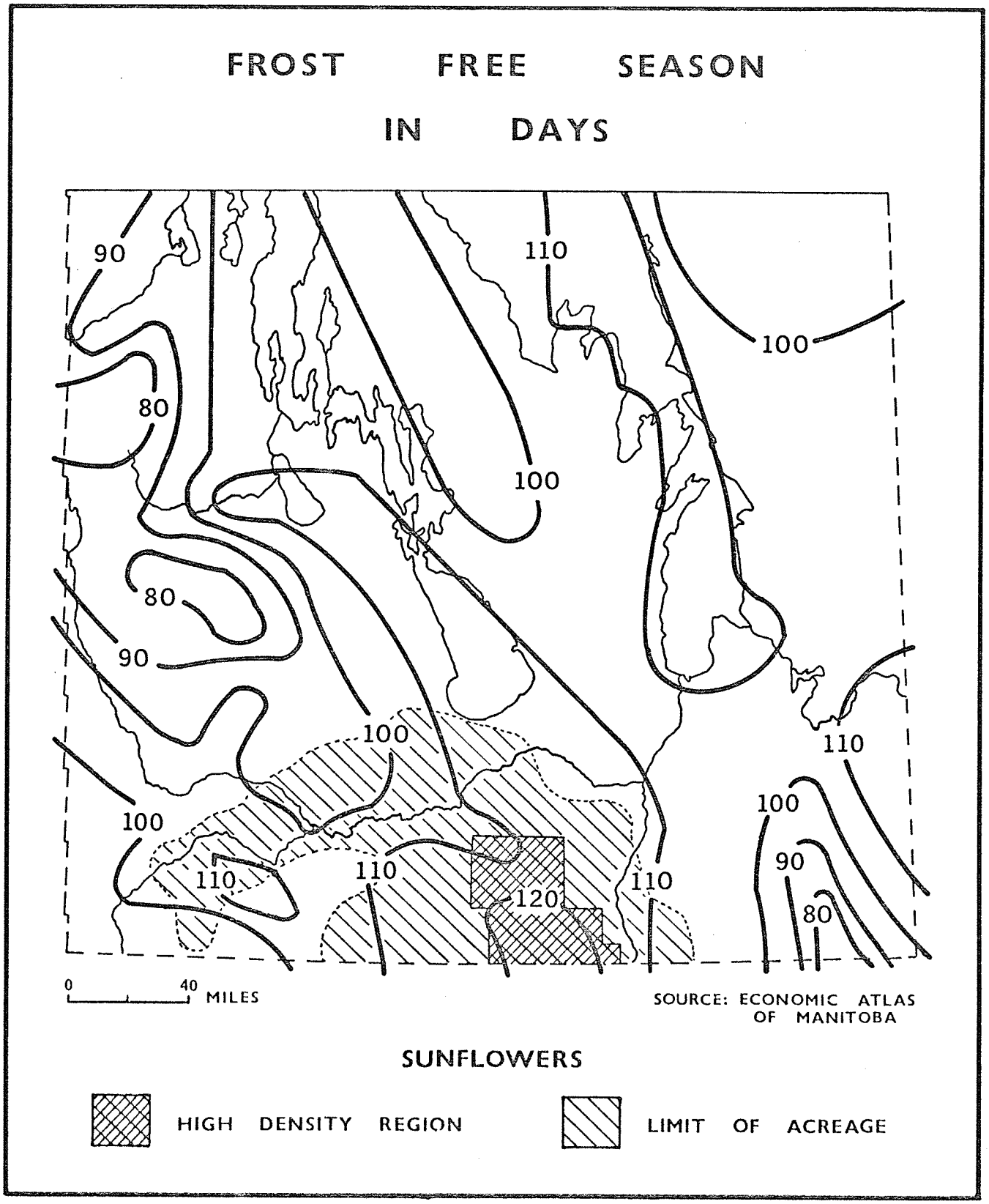
FROST FREE SEASON
IN DAYS
90
110
100
80
100
80
90
100
110
100
90
80
110
110
120
110
0
40
MILES
SOURCE: ECONOMIC ATLAS OF MANITOBA
SUNFLOWERS
HIGH DENSITY REGION
LIMIT OF ACREAGE

FIGURE 14

ideal of 150 days, the highest density is located in that part of the province where the longest growing season prevails. There is in effect an addition to the growing season in that the young sunflower plant can withstand temperatures as low as 22 degrees F. until the four leaf stage is reached.[6]

(ii) Heat Available (Temperature) During the Growing Season

The amount of heat available to the plant during the growing season determines to a large degree the rate of growth and the quality of the mature seed. If, during the seeding period and immediately after, warm weather occurs, emergence will be rapid. Continuing heat will promote growth and development and contribute to high yield.

The optimum temperature conditions for sunflower growth are hot days and warm nights. In more specific terms, the ideal daytime temperature would be in the vicinity of 80 to 85 degrees F. and night temperatures of approximately 50 degrees F. throughout the growing season.[7] The extent to which these conditions are met in the Manitoba sunflower growing region is shown in Table VI.

The stations represented are all within the growing region as determined by Figure 12. However Altona, Emerson,

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[6] Eric D. Putt, *Sunflower Seed Production*, Canada Department of Agriculture, Publication 1019 (Ottawa: Queen's Printer, 1957), p. 8.

[7] Statement by Dr. E.D. Putt, personal interview, August 27, 1968.

TABLE VI

Mean Daily Temperatures at Selected Stations in Manitoba

Station		May	June	July	August	Sept.	Oct.
Altona	Max.	66.1	74.3	80.9	78.4	67.0	54.4
	Min.	41.9	51.9	56.7	53.6	43.0	32.8
Brandon	Max.	65.0	72.6	80.5	77.7	66.5	53.6
	Min.	39.3	49.0	54.0	51.2	40.8	29.8
Emerson	Max.	66.4	74.5	81.1	78.7	67.1	54.5
	Min.	39.2	50.7	56.0	54.4	44.1	33.2
Morden	Max.	65.6	74.2	81.7	78.8	67.6	49.6
	Min.	41.8	52.4	58.5	55.8	45.6	39.0
Morris	Max.	66.8	74.7	81.2	79.6	68.5	55.3
	Min.	40.7	51.2	57.7	54.8	43.6	31.6
Portage la Prairie	Max.	61.8	71.3	78.8	76.7	63.8	54.5
	Min.	40.1	50.9	57.0	54.6	43.8	35.2
Winnipeg	Max.	64.1	72.6	79.7	77.5	65.6	52.6
	Min.	40.6	50.8	56.8	54.5	44.6	33.7

Source: Canada Department of Transport, Meteorological Branch, *Temperature and Precipitation Tables for Prairie Provinces*, Volume III (Toronto: Queen's Printer, 1967), pp. 40-51.

Morden and Morris are either within or on the fringes of the high density acreage or core area while Brandon, Portage la Prairie and Winnipeg are on the outer extremities of the growing region. It will be observed that night temperature requirements are met in June, July and August at all stations with the optimum high day temperatures fulfilled in July and August. Also those stations in or next to the core area have perceptibly higher temperatures than those on the periphery of the growing region.

The months of May, June and July are the most important period for growth. May is noteworthy as seeding usually takes place during this time with the recommended period between the first and twenty-fifth.[8] In general, cool temperatures prevent growth at night in the Red River Valley before May 25th.[9]

The average temperatures for the months of June and July are illustrated in Figures 15 and 16, respectively. With regard to Figure 15 the area of maximum acreage density, the core area, is located entirely within the 62 degree isotherm, while the major portion of the remaining acreage is within the 61 degree isotherm. Throughout the growing region, the average monthly mean maximum temperature for

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[8] R.G. Robinson, F.K. Johnson and O.C. Soine, *The Sunflower Crop in Minnesota*, Agricultural Extension Service, University of Minnesota, Extension Bulletin 299 (St. Paul: University of Minnesota, 1967), p. 11.

[9] A.J. Connor, *The Climate of Manitoba* (Winnipeg: Manitoba Economic Survey Board, 1939), p. 72.

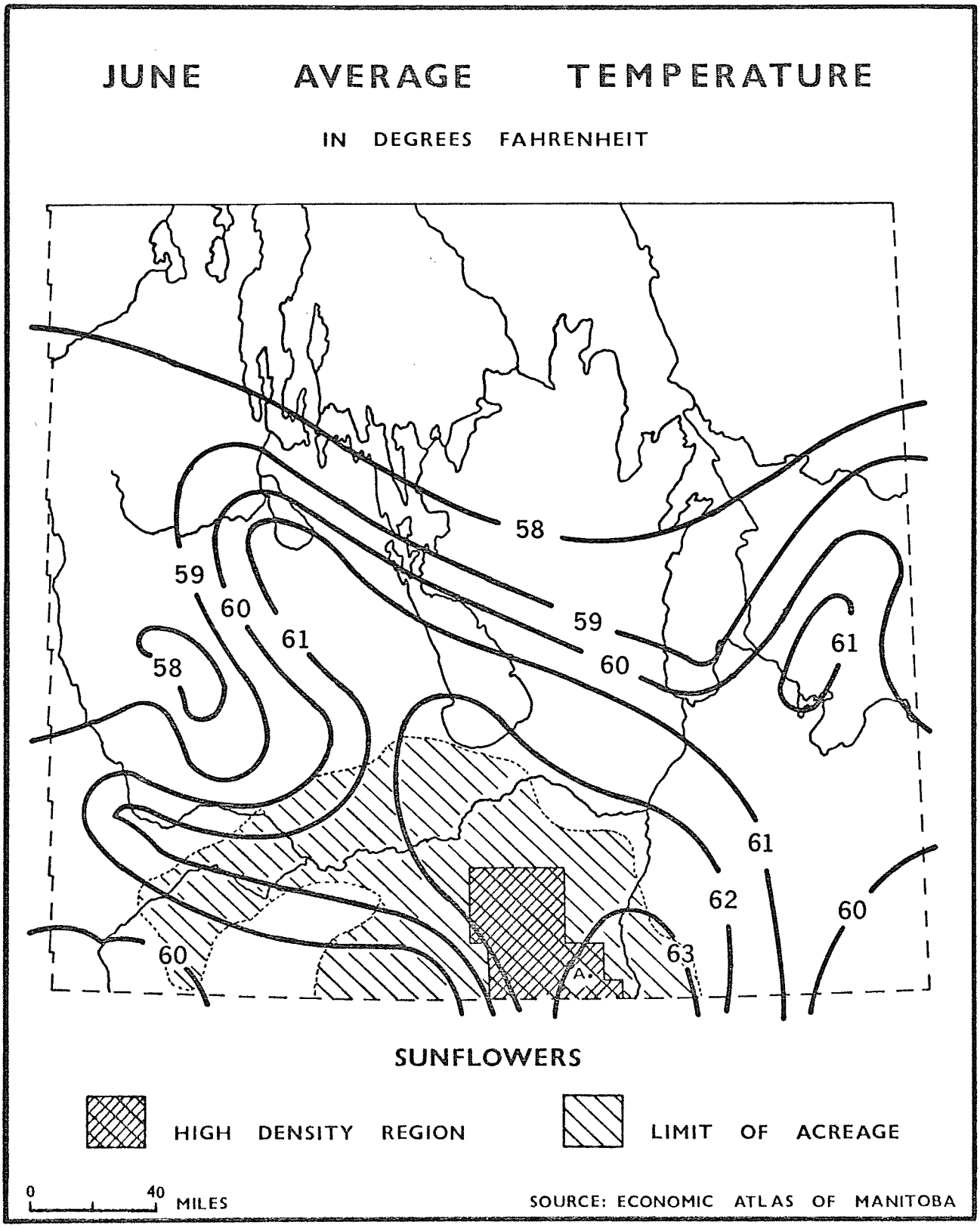
JUNE AVERAGE TEMPERATURE
IN DEGREES FAHRENHEIT
58
59
60
61
58
59
60
61
61
62
60
60
63
SUNFLOWERS
HIGH DENSITY REGION
LIMIT OF ACREAGE
0
40
MILES
SOURCE: ECONOMIC ATLAS OF MANITOBA

FIGURE 15

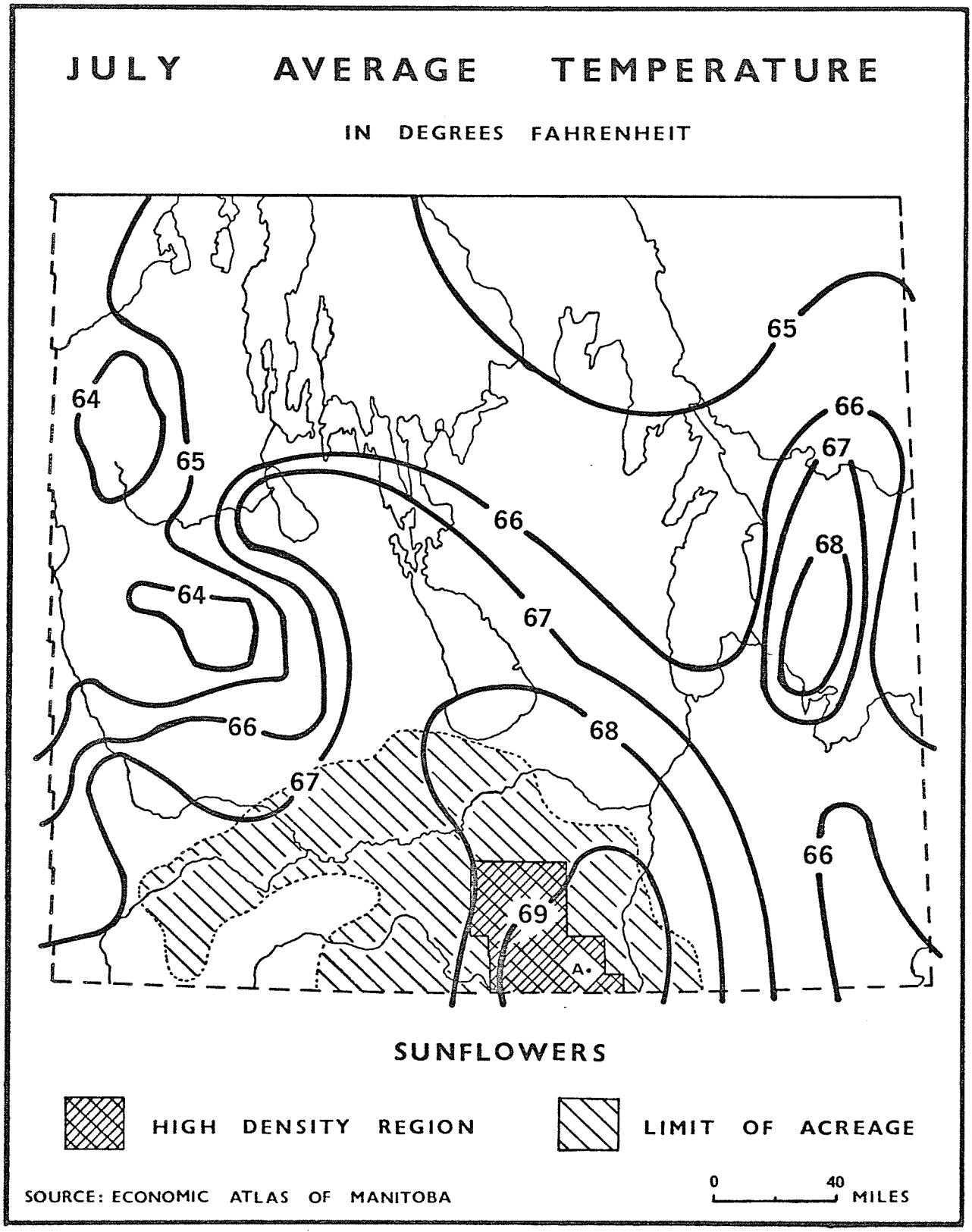
JULY AVERAGE TEMPERATURE
IN DEGREES FAHRENHEIT
64
65
66
67
68
69
A.
SUNFLOWERS
HIGH DENSITY REGION
LIMIT OF ACREAGE
SOURCE: ECONOMIC ATLAS OF MANITOBA
0
40
MILES

FIGURE 16

June ranges from 72 to 75 degrees F. with the mean minimum temperature in the vicinity of 49 to 51 degrees F.[10] The higher maximum and minimum temperatures are oriented towards the core area.

It will be noted in Figure 16, which depicts the July average temperature, that the core area is now within the 69 degree isotherm and the 67 degree isotherm borders the remaining acreage. The average mean maximum temperature for July in the growing region ranges from 78 to 80 degrees F. The mean minimum temperature is approximately 53 degrees F.[11]

The average maximum and minimum temperatures for August are much the same as July although a decline of one or two degrees occurs in both the day and night temperatures. A further reduction also appears in September with the core area having 67 degrees mean maximum temperature and the outer limits of the sunflower region within the 65 degree isotherm.[12] The mean minimum temperature for September is approximately 40 degrees throughout the entire sunflower region.[13] The October mean maximum temperature for the sunflower region is 51 degrees and mean minimum temperature approximately 30 degrees.[14]

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[10] Connor, *op. cit.*, pp. 49, 73.

[11] *Ibid.*, pp. 50, 74.

[12] *Ibid.*, p. 52.

[13] *Ibid.*, p. 76.

[14] *Ibid.*, pp. 53, 77.

Figure 17 exhibits the growing degree-days which are defined "... as the accumulation of degrees of temperature above a daily mean of 42 degrees."[15] For many plants this temperature must be attained before germination or growth takes place.[16] Note in Figure 17 that the high acreage concentration is located within the 2800 degree-day zone, and the balance within the 2700 degree-day isarithm. Therefore portions of Manitoba do meet the required temperature conditions for July and August, with somewhat cooler temperatures prevalent in May and June. It is also noted that the core area is located in the warmest part of the province. Hence, considering temperatures, sunflowers are grown in the most desirable region.

B. Water Supply

The manner in which water demands are supplied will vary from one location to another and can usually be classed as either artificial such as irrigation or natural such as rainfall. In the Manitoba growing region the water demands are met naturally. Needs for water vary with both the type of crop and the location. In any region the heat available during the growing season will determine the evaporation rate, with higher temperatures causing a greater evaporation rate and vice versa. The evaporation rate in

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[15] Weir, *op. cit.*, p. 16.

[16] *Ibid.*

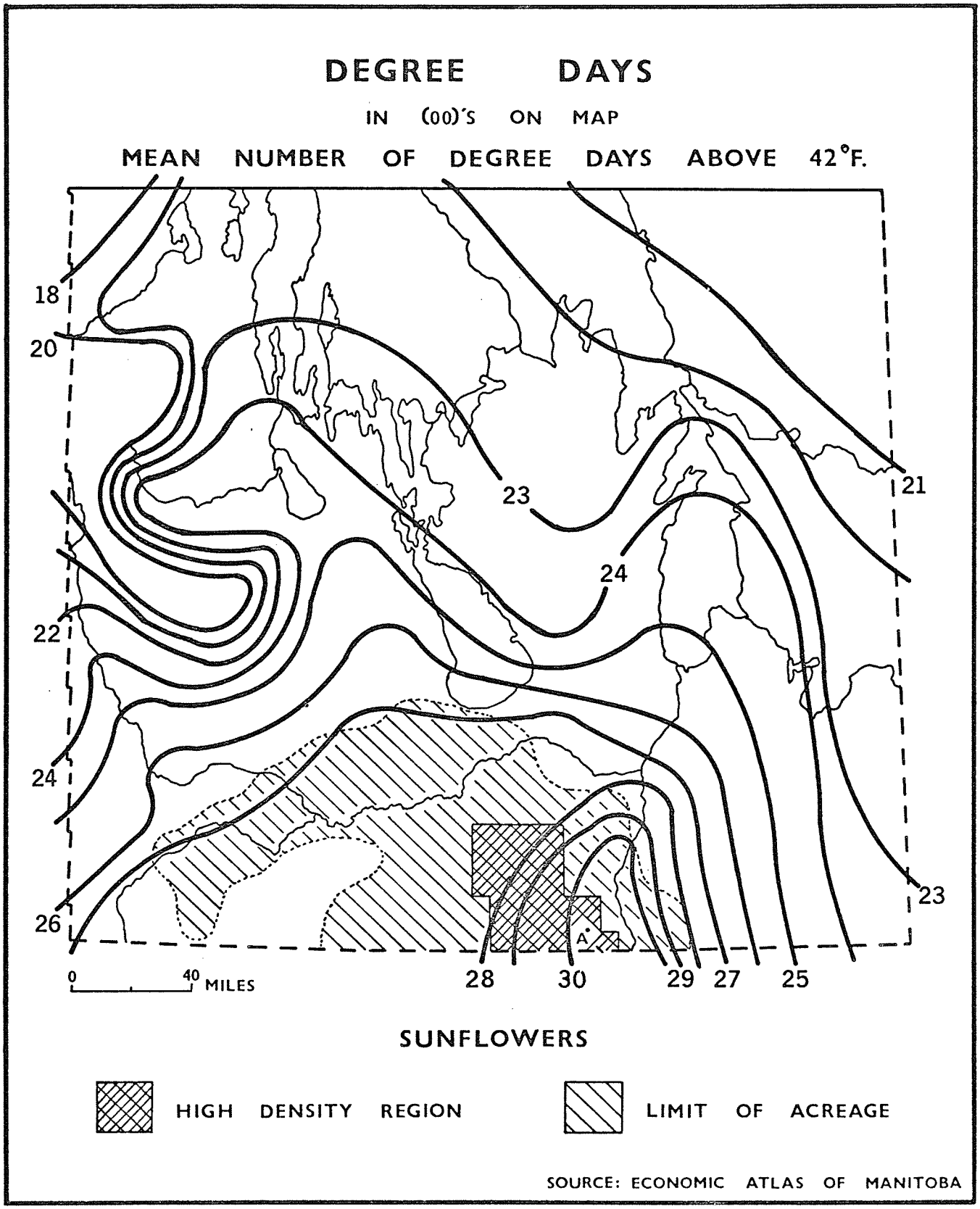
DEGREE DAYS
IN (00)'S ON MAP
MEAN NUMBER OF DEGREE DAYS ABOVE 42°F.
18
20
23
21
24
22
24
26
23
28
30
29
27
25
0
40 MILES
SUNFLOWERS
HIGH DENSITY REGION
LIMIT OF ACREAGE
SOURCE: ECONOMIC ATLAS OF MANITOBA

FIGURE 17

turn directly affects the amount of precipitation available to the plant.

Although sunflowers are quite tolerant to drought, the ideal amount of precipitation is considered to be approximately 15 to 20 inches spread fairly evenly over the growing season.[17] A dry period during the latter stages of ripening is also desirable.

Figure 18 depicts the amount of precipitation received during May, June and July, which are the critical months in the growth of crops in this region. Incorporated within the map are the limits of sunflower acreage along with the heaviest concentration or core area. Note that all acreage is located where the average precipitation is between seven and eight inches during the growing season.

The difference between the ideal and the actual is in reality not as great as it at first appears. Since the ideal amount is based upon higher temperatures and hence higher evapo-transpiration rates, the lower average temperatures in the Manitoba growing region will result in lower moisture need.

The main source of this moisture during the growing season is the Gulf of Mexico and is classed as maritime tropical.[18] The precipitation is generally frontal in

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[17] Statement by Dr. E.D. Putt, personal interview, August 27, 1968.

[18] Weir, *op. cit.*, p. 14.

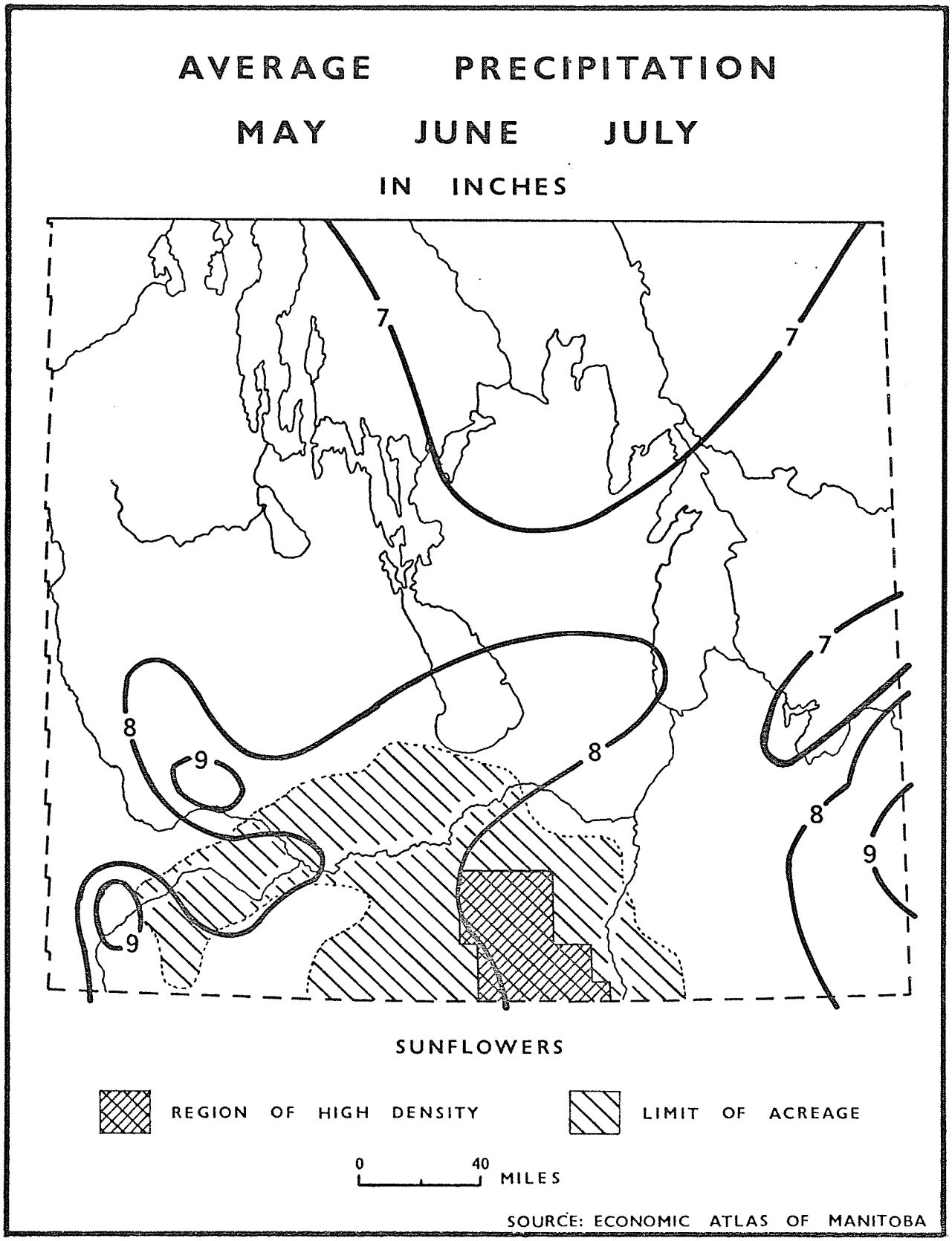
AVERAGE PRECIPITATION
MAY JUNE JULY
IN INCHES
7
7
7
8
9
8
8
9
9
SUNFLOWERS
REGION OF HIGH DENSITY
LIMIT OF ACREAGE
0
40
MILES
SOURCE: ECONOMIC ATLAS OF MANITOBA

FIGURE 18

origin.[19] Of great import is that the amount of precipitation from year to year is rather consistent.[20]

To summarize, the amount of precipitation in the Manitoba growing region is somewhat below the ideal. However, the moisture supply is normally adequate for good growth due to the lower evapo-transpiration rates, consistency of annual precipitation and the drought tolerance of the sunflower plant.

C. Light

Light, which is really sunshine, is important in promoting growth. The growth rate is in most instances directly proportional to the amount of sunshine received during the growing season.

The sunflower growing region of Manitoba has a very high mean sunshine rate. Evidence in support of this statement is provided in Table VII where data concerning the hours of sunshine are given for Winnipeg, Brandon, and Morden. These three stations are representative of the growing region in that Winnipeg and Brandon are located on the northeast and northwest fringe, respectively, while Morden is within the core area. It is to be noted that there are over 2100 hours of sunshine per year for each station with more than 1200 hours from May through to

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[19] Weir, *op. cit.*, p. 14.

[20] *Ibid.*, p. 16.

TABLE VII

Monthly Mean Hours of Sunshine

Winnipeg												
J	F	M	A	M	J	J	A	S	O	N	D	Total
101	130	167	204	245	250	294	263	178	133	84	78	2127
Brandon												
J	F	M	A	M	J	J	A	S	O	N	D	Total
103	128	160	200	238	230	302	269	187	145	86	81	2129
Morden												
J	F	M	A	M	J	J	A	S	O	N	D	Total
101	136	161	206	240	224	299	266	193	162	91	89	2168

Source: Canada Department of Transport, Meteorological Branch, *Climatic Normals Sunshine, Cloud, Pressure and Thunderstorm*, Vol. III (Toronto: Queen's Printer, 1968), pp. 1, 2.

September. The growing region, therefore, is well favored with sunshine to stimulate growth.

II. Soils

As a general rule the more fertile the soil available to sunflowers the better the plant will thrive, providing other physical factors remain constant. However, the adaptability of sunflowers is again shown with respect to soils as they have been successfully grown on soils ranging from sand to clay in texture although it is advised that they not be sown on heavy soils.[21]

The soils in the core area of the sunflower growing region are predominantly blackearth developed on medium and fine textured sediments (Figure 19). These sediments represent depositions within glacial Lake Agassiz. The natural vegetation in this area was prairie grass, which has been almost entirely removed through cultivation.

The main subtype of the medium textured sediments located in this region is the Altona association.[22] These soils have been developed on lacustrine and deltaic sediments on a very gently sloping topography.[23] They are easily worked, promote early and rapid growth, have

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[21] Putt, *Sunflower Seed Production, op. cit.*, p. 5.

[22] W.A. Ehrlich *et al.*, *Soils Report No. 5* (Winnipeg: Manitoba Department of Agriculture, 1953), map supplement.

[23] *Ibid.*, p. 30.

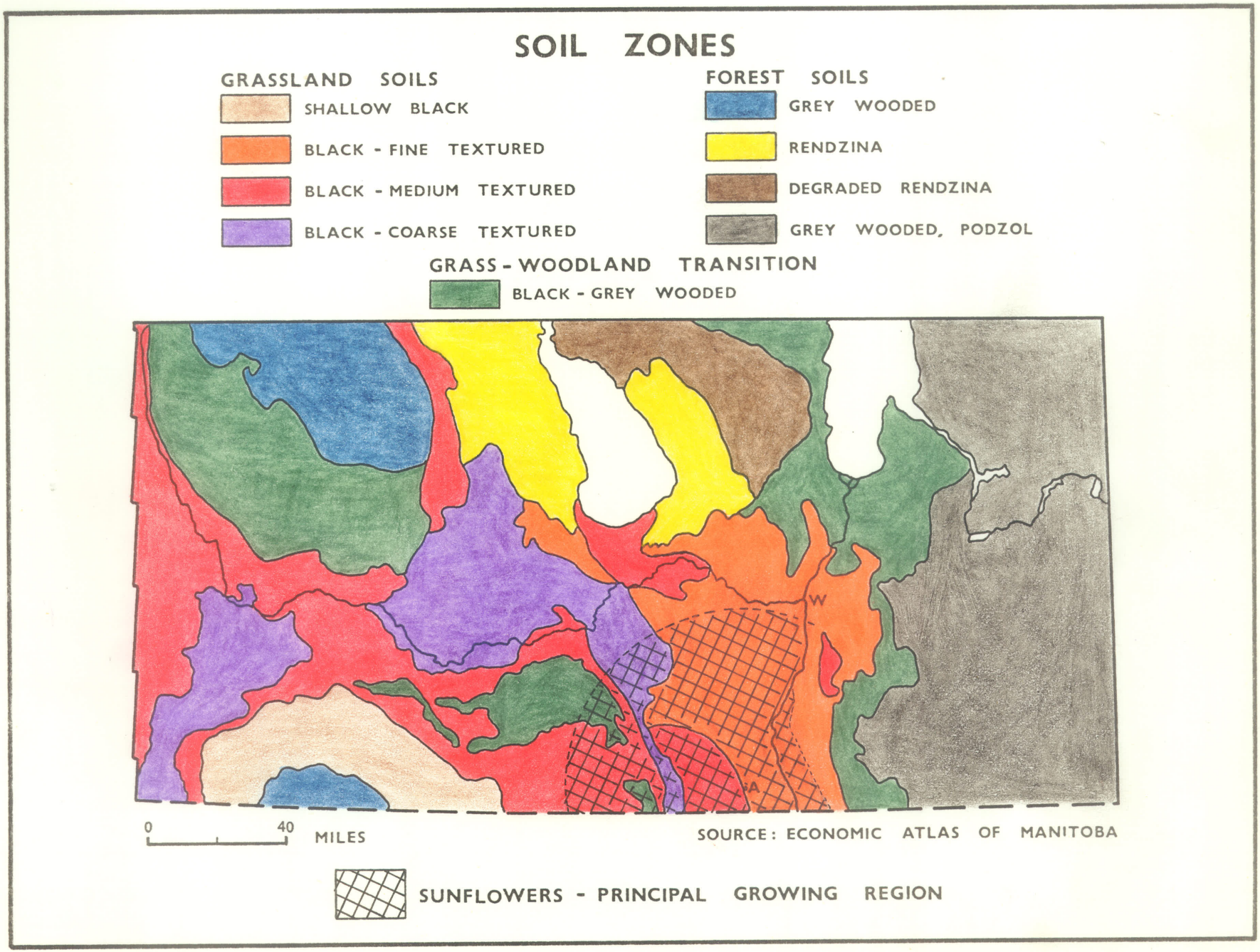
SOIL ZONES
GRASSLAND SOILS
SHALLOW BLACK
BLACK - FINE TEXTURED
BLACK - MEDIUM TEXTURED
BLACK - COARSE TEXTURED
FOREST SOILS
GREY WOODED
RENDZINA
DEGRADED RENDZINA
GREY WOODED, PODZOL
GRASS - WOODLAND TRANSITION
BLACK - GREY WOODED
W
A
0
40
MILES
SOURCE: ECONOMIC ATLAS OF MANITOBA
SUNFLOWERS - PRINCIPAL GROWING REGION

FIGURE 19

excellent natural fertility and good surface drainage.[24] The major negative feature of these soils is their susceptibility to loss of organic matter by wind erosion.[25] Shelter belts and fallow substitutes are recommended erosion safeguards.[26]

Red River Clay and Osborne Clay are the main subtypes of the fine textured soils.[27] These have been developed on lacustrine fine clay deposits on flat topography.[28] Although drainage can be a problem, the soils are very productive when good soil management practices are maintained.[29]

Therefore the soils within the core area are good for sunflowers and in general are excellent for all agricultural purposes. The soils in the remaining sunflower growing region vary locally but as they are mainly grassland types they are well suited to sunflowers (Figure 19).

III. Relief and Drainage

The relief throughout the sunflower growing region is generally flat or gently undulating. The gradient between the Red River and the Manitoba Escarpment on a line

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[24] Ehrlich, *op. cit.*, p. 31.

[25] *Ibid.*

[26] *Ibid.*

[27] *Ibid.*, map supplement.

[28] *Ibid.*, p. 56A-1.

[29] *Ibid.*, pp. 21-22.

through Winkler and Morden, which includes the core area, is only 250 feet for a distance of approximately 40 miles.[30] This extreme flatness offers distinct advantages as it is easily tilled with mechanical equipment and almost all of it is arable. The major disadvantage of such level land is the problem associated with poor drainage. However, "Drainage Maintenance Boards" have been organized to construct a system of municipal drainage ditches to alleviate this problem where it exists.[31]

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[30] Weir, *op. cit.*, p. 7.

[31] Ehrlich, *op. cit.*, p. 90.

CHAPTER VI

CULTURAL PRACTICES

The cultural practices for sunflowers are similar to cereal crops. They differ from cereals in that they are grown as a row crop, as are corn and sugar beets both of which have been successfully grown in southern Manitoba. Since many farmers have experience growing these crops, the addition of sunflowers, another row crop, should create no problems. Some of the special equipment required for sunflowers such as row crop seeders and intertillage cultivators would be available on most farms.

For those farmers who undertake the growing of sunflowers as their initial experience with row crops, the starting expenses need not be excessive. Costs may be kept to a minimum by sharing the purchase of special equipment with others in a similar situation, renting the necessary equipment or by custom operations. Therefore a venture into sunflowers can be achieved at a reasonable cost by those with or without experience in row crops.

Another advantage of growing sunflowers is that it extends the crop rotation by at least one year. It is an

acceptable procedure to plant sunflowers on a field as the third or fourth crop after summerfallow.[1] Good yields can be obtained when proper cultural practices are used.

The principal theme of this chapter is to outline the major cultural practices associated with sunflower growing. As much as possible a flexible range of recommended procedures is offered to suit all local conditions within the sunflower growing region of Manitoba.

I. Seed Treatment

It is recommended that the sunflower seed be treated prior to planting to safeguard the seed and seedling against soil-borne diseases and insects which may cause harmful effects if unchecked.[2] At present the planting seed available at the CVO plant in Altona is not treated. However, they do stock for resale the special compound "Lindasen" for those who wish to treat their seed.[3] This product contains lindane, a component designed "... to protect the seed and emerging seedlings against wireworms, flea beetles and certain other soil-borne insects."[4] A

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[1] Eric D. Putt, *Sunflower Seed Production*, Canada Department of Agriculture, Publication 1019 (Ottawa: Queen's Printer, 1967), p. 5.

[2] *Ibid.*, p. 8.

[3] P. Bergen, "Sunflower Production Guidelines for 1969" (Altona: Co-op. Vegetable Oils Ltd., 1969), p. 3. (Mimeographed).

[4] *Ibid.*

fungicide, named captan, is also incorporated within the compound to shield newly planted seed against blight and decay.[5]

Mecurial chemicals that are used on other crops have been successfully applied to sunflowers.[6] The recommended rate using these chemicals is one and one-half ounces per bushel.[7] However, it is cautioned that no dosage above the recommended rate be administered as deformed seedlings have resulted through excessive overdoses.[8]

II. Seeding Operation

There are three significant aspects to the seeding process. These are the seedbed, seeding depth, and rates and spacing.

Seedbed

It is desirable to prepare a seedbed that is reasonably firm. A firm seedbed achieves three benefits:[9]

1. it is instrumental in bringing moisture near the surface by capillary action, thereby promoting

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[5] Bergen, *op. cit.*, p. 3.

[6] Putt, *op. cit.*, p. 8.

[7] *Ibid.*

[8] R.G. Robinson, F.K. Johnson and O.C. Soine, *The Sunflower Crop in Minnesota*, Agricultural Extension Service, University of Minnesota, Extension Bulletin 299 (St. Paul: University of Minnesota, 1967), p. 11.

[9] Putt, *op. cit.*, p. 8.

rapid emergence.

2. it enhances an even emergence.
3. it allows for a shallower depth of seeding which also fosters a more rapid emergence.

Since sunflowers are a row crop, wind erosion and soil drifting are potential problems. The problem becomes especially acute in the flat Red River Valley if some form of windbreak is not in existence, whether natural or artificial. Regardless of whether a windbreak is or is not present, wind erosion can be retarded if the seedbed is left with a trash cover or soil lumps.[10]

Seeding Depth

Because sunflower seed has a thick hull, considerable moisture is needed to germinate it.[11] Therefore the seed must be sown at a depth where the required moisture is available. This is usually two inches below the surface but may vary from one to four inches depending on soil type, seedbed firmness and amount of spring moisture.[12]

Rates and Spacing

There is no definite rule with regard to spacing between the rows as good results have been obtained at

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[10] Putt, *op. cit.*, p. 8.

[11] *Ibid.*

[12] Bergen, *op. cit.*, p. 3.

distances ranging from 20 to 40 inches. Those farmers using sugar beet cultivators to control weeds between the rows have had considerable success with 22 inch rows.[13] Although some authorities state that the best results are obtained with 24 inch rows, the usual practice is to seed "... with corn planters in rows 36 to 40 inches apart or with a grain drill with certain holes covered to give rows of suitable width for cultivation."[14]

The recommended distance between the plants within each row is directly related to the width between the rows i.e. the closer together the rows the farther apart are the plants within the row and, conversely, the farther apart the row, the closer should be the plants within the row. This information is conveyed in Table VIII which delineates the space between the plants as determined by the desired row width and the number of plants per acre.

The optimum number of plants per acre depends on soil type, available moisture and variety used. The better soils can naturally carry more plants e.g. Table VIII, column 2. Since the available moisture throughout the Manitoba sunflower growing region is reasonably consistent (Figure 18), this factor is not of great significance. Because the variety determines the mature plant size,

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[13] Bergen, *op. cit.*, p. 4.

[14] Roger Fry, "Take Another Look at Sunflowers," *Country Guide*, March 1969, p. 6; see also Bergen, p. 4.

TABLE VIII

Row and Plant Spacing, Determined by Plants per Acre

Row Spacing (in inches)	Distance in inches between plants within each row, based upon plants per acre	
	Column 1	Column 2
40	7.7	5.2
36	8.6	5.8
30	10.0	7.0
24	13.0	8.7
18	17.0	11.7
12	26.0	17.5
Plants per acre	21,200	29,000

Source: P. Bergen, "Sunflower Production Guidelines for 1969" (Altona: Co-op. Vegetable Oils Ltd., 1969), p. 4. (Mimeographed.)

greater populations per acre should be sown of a variety developing small plants than one producing large types. Tests at the Morden Research Station have shown that the greatest yields were obtained at the equivalent of 29,000 seeds per acre for the varieties with larger plants and 43,000 for those with smaller plants.[15]

III. Weed Control

Weeds, as in most other crops, are detrimental to sunflowers. They vie with the seedlings for moisture and soil nutrients thereby adversely affecting the total crop yield. Although sunflowers can compete reasonably well with most weeds, in some instances, notably with perennial weeds such as sowthistle or quack grass, they are unsuccessful.[16] Further, if weeds are not controlled, the seed they produce adds to the infestation in the soil and increases expense for their removal in subsequent years.

A number of successful methods are recommended to control weeds in the sunflower crop. One general method, which is applicable regardless of the type of weed, and probably the most familiar to the Manitoba farmer because of its lengthy usage, is to destroy as many weeds as possible prior to seeding by working the field with implements such as

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[15] Bergen, *op. cit.*, p. 5.

[16] Putt, *op. cit.*, p. 5.

a cultivator or disker. This operation not only kills many weeds but also delays the growth of others thereby allowing the sunflower seedling to compete with the weed.

Another method is harrowing. This procedure, which may also be classed as general since most types of weeds are involved, starts about one week after seeding or before the crop has emerged.[17] It is repeated when the plants are in the four to six leaf stage. Cross-harrowing the fields is advocated using either light diamond harrows or finger weeders or rotary hoe. Weed control is thereafter maintained by a row cultivator which operates between the rows until the possiblility of damage to the growing plants prohibits this operation or when the plants are about two feet in height.[18]

The chemical control of weeds has achieved prominence in recent years. This method is probably the best as it is selective in that certain chemicals can be applied to deal with specific types of weeds. Since sunflowers may be damaged by some chemicals e.g. 2,4-D, which should not be used within one-quarter mile of a sunflower field, extreme care should be exercised in both selection and application.[19] The chemicals currently recommended for sunflowers are

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[17] Putt, *op. cit.*, p. 9.

[18] *Ibid.*, p. 10.

[19] *Ibid.*, p. 12.

Carbyne, Avadex, Treflan and Eptam.[20] Of these, all, except Carbyne, must be applied before seeding. These chemicals are excellent for the control of wild oats and green foxtail.[21]

Although the aforementioned methods involve some expense, the merits of weed control make it worthwhile.

IV. Fertilizer

The use of fertilizer is recommended in view of the advantages offered through its application. In some tests yield increases as high as 70 percent have been attained.[22] Greater seed weight and an earlier maturity are also evident in most cases.[23]

Since fertilizers are expensive it is extremely important that both the correct type and amount be determined as accurately as possible. The best way to decide the proper fertilizer is through soil testing, which will help to ensure that the benefits more than offset the expenses.

To prevent possible injury to the seed, the fertilizer should not be planted immediately next to the seed when sowing. Side-banding or broadcasting are the recommended

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[20] Bergen, *op. cit.*, p. 7.

[21] *Ibid.*

[22] *Ibid.*, p. 6.

[23] Putt, *op. cit.*, p. 8.

methods of application.[24]

V. Harvesting

The actual sunflower harvest operation is in most respects similar to cereal grains. Harvesting normally begins when the sunflower plant is fully mature and sufficiently dry. This occurs after killing frosts, and is usually about mid-October if seeding took place in early May.[25]

Analogous to the cereal crops, harvesting does not take place until the moisture content of the seed is below a specified percentage - for sunflowers it is 12 percent.[26] If the moisture content is not below this level when harvested, spontaneous heating could take place when the crop is stored. Unlike most cereal grains, the mature sunflower crop can in most cases be left standing in the field with a minimum amount of damage or shattering arising from the wind.[27] As a result there is no necessity to harvest the crop when the moisture content is above the recommended level.

No special combine is manufactured exclusively for sunflowers. It is possible to use the standard cereal grain

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[24] Bergen, *op. cit.*, p. 6.

[25] Putt, *op. cit.*, p. 12.

[26] *Ibid.*

[27] *Ibid.*

combine providing the cyclinder speed can be reduced to 550 - 600 revolutions per minute.[28] Sunflowers require slower cylinder speeds than those for cereal grains but straw walkers and sieves must operate at normal speed to permit effective separation. There are, however, two modifications which must be made to the combine so it can harvest sunflowers. First the conventional reel is removed and a smaller one installed with a curved shield mounted in front of it.[29] Secondly "pans" are attached to the cutter bar. They extend approximately four feet in front of the bar, are nine inches in width with a three inch space between individual pans.[30] The prime function of these two items is to guide the stalk so that the head reaches the knife and is removed with a minimum of stalk attached. The pans also catch a high percentage of seeds that fall out as the head is separated from the stem. Although most farmers can easily construct their own attachments from available plans, it is also possible to purchase a commercial model.

The sunflower harvest normally presents few problems. Because of the late season in which it is carried out there is little competition from other crops for the use of the

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[28] Statement by Dr. H.L. Sawatzky, Department of Geography, University of Manitoba, August 1970.

[29] Putt, *op. cit.*, p. 14.

[30] *Ibid.*

combine.

VI. Diseases

The sunflower plant is susceptible to a number of diseases which, if not detected early and measures taken to control them, can adversely affect the yield. Fortunately almost all the diseases may be suppressed providing there is adherence to the recommended procedures. A brief resume of the more prevalent diseases, their symptoms and recommended control follows. These diseases are illustrated in Figure 20.

Sunflower rust may attack all susceptible varieties, with the degree of damage directly related to the crop's stage of growth when the invasion occurs. Early infection may cause as high as a 50 percent yield reduction, with later infection being proportionally less serious.[31]

The disease primarily affects the leaves and occasionally the stem and lower surface of the head. Initial symptoms consist of small clusters of pale yellow or orange spots appearing on the upper surface of the first leaves and occurring in mid-June.[32] These spots then change to

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[31] Canada Department of Agriculture, *Diseases of Field Crops in the Prairie Provinces*, Publication 1008 (Ottawa: Queen's Printer, 1967), p. 69.

[32] A.L.D. Martin, *Sunflower Rust*, Manitoba Department of Agriculture and Conservation, Soils and Crops Branch, Publication 437, September, 1966 (Winnipeg: Queen's Printer, 1966).

DOWNY MILDEW
Plasmopara halstedii

SCLEROTINIA WILT
Sclerotinia sclorotiorum

LEAF MOTTLE OR VERTICILLIUM WILT
Verticillium albo-atrum Reinke & Berth

ASTER YELLOWS
Virus

SUNFLOWER RUST
Puccinia helianthi

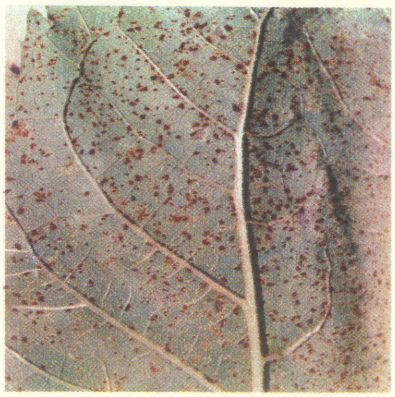

FIGURE 20

DISEASES OF SUNFLOWERS

dark brown on both surfaces of the leaves in late July or early August, with a darker brown being evident as the plant matures.[33] Under heavy infection the entire surface of the leaves will be affected, in which case the leaves will die prematurely.[34]

The best control is to plant rust-resistant varieties.[35] However this is not always practical since such seed may be inferior in other more desirable characteristics such as oil content. Where rust susceptible varieties are used, a four or five year crop rotation is recommended with the new crop being planted as far as possible from that of the previous year.[36] The destruction of all volunteer seedlings is also advised.[37] These two procedures are advocated because the spores overwinter on dead leaves and stems and may infect the volunteer sunflower seedlings thereby providing an initial source of infection which spreads to other fields by wind.[38]

Leaf mottle or verticillium wilt under severe

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[33] Martin, *Sunflower Rust*, *op. cit.*

[34] *Ibid.*

[35] *Ibid.*

[36] Canada Department of Agriculture, *op. cit.*, p. 71.

[37] *Ibid.*

[38] *Ibid.*

infestation may reduce yield 50 percent.[39] This disease along with sunflower rust are the two most serious diseases affecting sunflowers in Canada.[40]

The first symptom of verticillium wilt is a yellowing between the veins of the lower leaves.[41] Since the area immediately adjacent to the veins retains its green appearance, the leaves display a mottled or two-colour complexion. Progression of the disease results in the altering of the yellow areas into brown and the eventual death of the infected area.[42] The infection also spreads up the stem to other leaves.

The best method to achieve control of the disease is through crop rotation, since it is a soil-borne fungus. Four years between successive sunflower crops is considered essential.[43] Seed obtained where the disease was prevalent should not be used for subsequent crops since reinfection may occur, either through diseased seed or by infected plant debris in the seed.[44]

Sclerotina wilt, although found in Manitoba in most years, usually kills only a small percentage of plants -

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[39] Canada Department of Agriculture, *op. cit.*,p. 71.

[40] Putt, *op. cit.*, p. 18.

[41] A.L.D. Martin, *Leaf Mottle or Verticillium Wilt*, Manitoba Department of Agriculture and Conservation, Soils and Crops Branch, Publication 368, January, 1964 (Winnipeg: Queen's Printer, 1964).

[42] *Ibid.*

[43] *Ibid.*

[44] *Ibid.*

five to ten percent - but mortality has on occasions gone as high as 50 percent.[45] The disease, overwintering in the soil, attacks the roots of the sunflower and subsequently spreads throughout the plant.[46]

The sudden wilting of the upper leaves about flowering time is usually the first readily observable symptom of sclerotina wilt.[47] After a few days all the leaves begin to droop, dry out and ultimately the entire plant succumbs.[48]

The control of sclerotina wilt consists of a long rotation, avoiding the inclusion of crops that are not resistant to the disease, and also the destruction of susceptible weeds such as wild sunflower, pigweed and Canada thistle, as the fungus may survive on them.[49]

Aster yellows is a virus which is often transmitted by insects from infected thistles and other perennial weeds.[50] The disease, first noticed in the province in

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[45] Canada Department of Agriculture, *op. cit.*, p. 73.

[46] *Ibid.*

[47] *Ibid.*

[48] *Ibid.*

[49] A.L.D. Martin, *Sclerotinia Wilt*, Manitoba Department of Agriculture and Conservation, Soils and Crops Branch, Publication 369, January, 1964 (Winnipeg: Queen's Printer, 1964).

[50] A.L.D. Martin, *Aster Yellows*, Manitoba Department of Agriculture and Conservation, Soils and Crops Branch, Publication 366, January, 1964 (Winnipeg: Queen's Printer, 1964).

1953, causes a portion of the head to remain green.[51] This deformed or infected area eventually turns brown and dies while the remaining part of the head will develop normal seed.[52] The only known control for this disease is the use of resistant varieties. Resistance is known to exist in breeding programs and the absence of any significant outbreak of disease since 1957 suggests that the present varieties are either resistant or tolerant to it.[53]

Downy mildew has never caused serious damage in Manitoba although on occasion severe losses have occurred in isolated fields.[54] The disease is most common during wet years as it is under moist conditions that the spores germinate and infect the root system.[55] From the infection in the roots the fungus spreads throughout the plant. The fungus may lie dormant in the soil and infect future crops. Since contaminated plants rarely produce normal seed, it is believed that the disease is not spread through infected seed.[56]

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[51] Martin, *Aster Yellows*, *op. cit.*

[52] *Ibid.*

[53] Personal Correspondence between Dr. E.D. Putt, Director, Research Station, Canada Department of Agriculture, Morden and the writer, January 12, 1972.

[54] Canada Department of Agriculture, *op. cit.*, p. 74.

[55] A.L.D. Martin, *Downy Mildew*, Manitoba Department of Agriculture and Conservation, Soils and Crops Branch, Publication 367, January, 1964 (Winnipeg: Queen's Printer, 1964).

[56] *Ibid.*

Symptoms of downy mildew may occur at almost any stage in plant growth. Seedlings which are infected exhibit a pale green or yellowish area near the midribs of the leaves.[57] A downy growth may occur on the under surface of the pale green portion in moist weather.[58]

Crop rotation is the recommended control.[59] Low wet fields should also be avoided when sowing since the fungus develops and spreads under moist conditions. The suppression of susceptible weeds such as wild sunflowers, thistles and ragweed which may carry the disease from one year to the next is desirable.[60]

The sunflower may also be attacked by powdery mildew, black stem, leaf spots and head rot.[61] In general none of these diseases has resulted in severe damage although head rot which has no control, may be potentially devastating as it occurs when there is a wet fall, a condition which is not unknown in Manitoba.[62]

To summarize, sunflowers may be ravaged by a considerable array of diseases. Fortunately, the majority of them can be checked by proper cultural methods and when available, resistant varieties.

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[57] Canada Department of Agriculture, *op. cit.*, p. 74.
[58] *Ibid.*
[59] *Ibid.*, p. 75.
[60] *Ibid.*
[61] *Ibid.*, p. 75-76.
[62] *Ibid.*, p. 76-77.

VII. Insects

A number of insect species are potentially harmful to sunflowers. However, they have been responsible for only limited damage since the plant has been grown commercially in the province. Although each species of insect attacks different parts of the plant and often at different stages of growth, all are detrimental to proper plant development if their numbers are sufficiently large.

Some insects attack sunflowers almost exclusively. These include the larvae of the sunflower moth and the banded sunflower moth which damage the seed by boring into it.[63] Also the sunflower leaf beetle attacks seedling sunflowers while its larvae eat the upper leaves.[64] Finally the larvae of the painted lady butterfly may also injure the leaves while the sunflower maggot bores into the stalk.[65]

The sunflower can be debilitated by a variety of insects which are detrimental to other crops. These include wireworms, cutworms, beet webworms and grasshoppers.[66]

Practically all of these insects may be effectively

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[63] Putt, *op. cit.*, p. 19.

[64] *Ibid.*

[65] *Ibid.*

[66] A.G. Robinson, D.R. Robertson and D.L. Smith, *Insect Control on Field Crops 1966 - 1967*, Manitoba Department of Agriculture and Conservation, Publication 277, April, 1966 (Winnipeg: Queen's Printer, 1966).

checked either by insecticides or seed treatment. Because of the many brands of insecticides on the market and the constant addition of new improved types, the best procedure for insect identification and control is to contact the district agricultural representative or competent entomologist.

VIII. Pests

The pest which is most apt to affect sunflowers is the blackbird and although there has never been widespread damage in Manitoba, isolated fields have on occasion been seriously ravaged. The damage occurs when the birds alight on the plant's head and eat the kernels.[67]

There are a number of ways in which the grower may keep losses from blackbirds to a minimum. Since these birds congregate in wooded and marshy areas, sunflowers should be planted as far as possible from such locations.[68] Nearness to ponds, dugouts, creeks or other water supply is also to be avoided since a greater water intake is required when the birds feed on sunflowers. Further, it is possible to protect the sunflower crop by maintaining

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[67] R.D. Bird and L.B. Smith, *Blackbirds in Field Crops*, Canada Department of Agriculture, Publication 1184 (Ottawa: Queen's Printer, 1963), p. 2.

[68] Putt, *op. cit.*, p. 20.

a feeding tract between the crop and the roosting area e.g. by planting narrow strips of oats.[69] Finally, devices such as acetylene exploders and firecrackers which frighten the birds are available and although not as effective as the foregoing items, scarecrows merit some consideration.[70]

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[69] Bird and Smith, *op. cit.*, p. 3.

[70] *Ibid.*, pp. 3-4.

CHAPTER VII

ECONOMIC ASPECTS OF GROWING SUNFLOWERS

Although a variety of factors have contributed to the continuance of sunflowers in the provincial economy, there are at least two of primary significant to the grower. Firstly, sunflowers have provided over an extended time an income per acre approximating that of other crops. Secondly, there has been a dependable market with no carryover of seed. Every effort is being made, mainly by CVO, to ensure that this stability will be retained within the industry. This chapter deals with the diverse features affecting the economics of growing sunflowers.

I. Income Compared to Other Crops

Planning figures prominently in the degree of success that a grower has in his farming operation. Based upon a number of criteria, the grower will determine what crops he is going to seed.

A major feature governing the selection of a crop is its cash return per acre. Certainly the continuance of a crop in a farm program is conditional to a large extent on

its previous economic performance. The introduction of a new crop such as sunflowers would undoubtedly depend on the grower believing the profits to be competitive with other crops he is growing.

On standard for comparing crops is the average gross income per acre. During a ten year span, from 1959 to 1968, the average return obtained in Manitoba for wheat was $37.26; oats - $25.98; barley - $27.31; flax - $28.47 and sunflowers - $33.04.[1] Although the costs of growing any crop vary with individuals, depending upon the amount of fertilizer and spray that is applied, the number of times the field is worked, etc., one farmer reported that his costs at $35.00 per acre for sunflowers were slightly above those for wheat.[2] However, in general, any costs above those considered basic are usually related to higher yields and hence a higher gross income. It is therefore a reasonable premise that there is a fairly stable relationship between costs per acre and the average income per acre. As a result, it is possible to conclude that sunflowers, at present, do successfully compete with the more common crops in Manitoba. Further, the average yield for sunflowers during the ten year period previously mentioned was 680 pounds per acre

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[1] Manitoba Department of Agriculture, *Yearbook of Manitoba Agriculture 1968* (Winnipeg: Queen's Printer, 1969), pp. 42-5, 51.

[2] Roger Fry, "Take Another Look at Sunflowers," *Country Guide*, March 1969, p. 6.

whereas authorities now believe that it is realistic to anticipate yields between 1,600 and 2,000 pounds per acre.[3] Therefore, if the latter figures do become a reality, a higher gross value per acre would certainly occur.

II. Contracts

In February 1959 the Board of Directors of CVO passed a resolution whereby sunflowers for their organization would be grown on a contract basis in the future.[4] In general terms, this meant that the farmer would commit himself in the spring to sow a specific number of acres in sunflowers and to sell all seed obtained from such acreage to the CVO plant for processing.

In the years prior to 1959 most of the sunflower seed grown in Manitoba had been sold to the Altona plant although the growers were not obligated to do so. This placed the farmers in the enviable position of being able to sell to the purchaser offering the highest price providing that more than one market was available. Also, as the sunflower oil from Altona gained wider acceptance, resulting in a degree of market stability, CVO began to receive inquiries for forward sales of oil well in advance

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[3] Fry, *op. cit.*, p. 6.

[4] Co-op. Vegetable Oils Ltd., *Sixteenth Annual Report* (Altona, 1959), p. 18.

of the required seed being delivered to the plant.[5] In order to commit themselves, CVO needed some assurance of obtaining the seed; one solution was contracting for production and delivery.

Contracting benefits both the grower and processor. The firm has an indication of the acreage available to fill confirmed orders and to make further forward sales of oil. This prevents a surplus of seed and contributes to the best prices being realized by both the grower and processor. Also, the minimum price in the contract aids the grower in planning his total operation and provides assurance, in writing, of a market. Further, because the contract stipulates that all seed will be delivered to the CVO plant by July 31 of the following year, the grower does not need to provide prolonged storage. CVO also compensates the grower four cents per 100 pounds per month for on-farm seed storage, commencing November 15 of the crop year. Finally, CVO reduces congestion at the plant by governing the movement of both the raw and finished product.

Until 1969, CVO offered two types of contract to the grower (see Appendix A for examples of 1969 contracts). The main difference between them was based on the market outlet of the seed. The most popular contract was known

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[5] *Sixteenth Annual Report, op. cit.*, p. 18.

as "Oilseed Sunflower Contract." It pertained to those varieties which yield high percentages of oil which in 1969 were Peredovik, Armavirec, Krasnodarets and Valley.

The other contract was called "Striped-seed Sunflower Contract." It was usually for seed of larger size and lower oil content which is marketed in the specialty trade. Commander was the most common variety used in this contract.

Since 1970 the individual contracts for oilseed and striped-seed were discontinued and replaced by one contract which embraced both seed types (see Appendix A for an example of a 1970 contract). In 1971 a trucking allowance was introduced to alleviate shipping costs. This means that the further a grower's acreage is located from the Altona plant, the greater the allowance. Henceforth, distance from the plant need not be a critical factor in growing sunflowers.

The system of contracting has met little opposition because it does not impose on the grower. Since the benefits seem to outweigh any disadvantages, it would appear that this method or some similar form of control over production will continue.

III. Yield

The yield per acre is the outcome of many factors such as the weather, cultural methods, fertilizer

application, seed quality and the severity of disease. Since these variables fluctuate from year to year, yields will also fluctuate.

Figure 21 shows the average yield per acre in Manitoba from 1943 to 1969. Two observations are clear. The first is that the range in yields, from 300 to 950, is large and the second that a wave-like pattern exists.

Figure 21 offers no evidence of yields increasing or decreasing. In an attempt to determine whether yields have increased, stabilized or decreased a five year running mean or moving average was introduced. This method, which removes disturbing influences by smoothing out the highs and lows, is shown in Figure 22. Although the wave-like pattern still exists, a trend towards increasing yields is evident since 1958 as yields in all years after this date exceed the 1958 figure. Therefore, from this data, it may be concluded that yields since 1958 are increasing moderately.

IV. Price Structure

The planting seed is available from the CVO plant in Altona. The price per pound, f.o.b. Altona, for each variety is as follows:[6]

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[6] P. Bergen, "Sunflower Production Guidelines for 1969" (Altona: Co-op. Vegetable Oils Ltd., 1969), p. 3. (Mimeographed.)

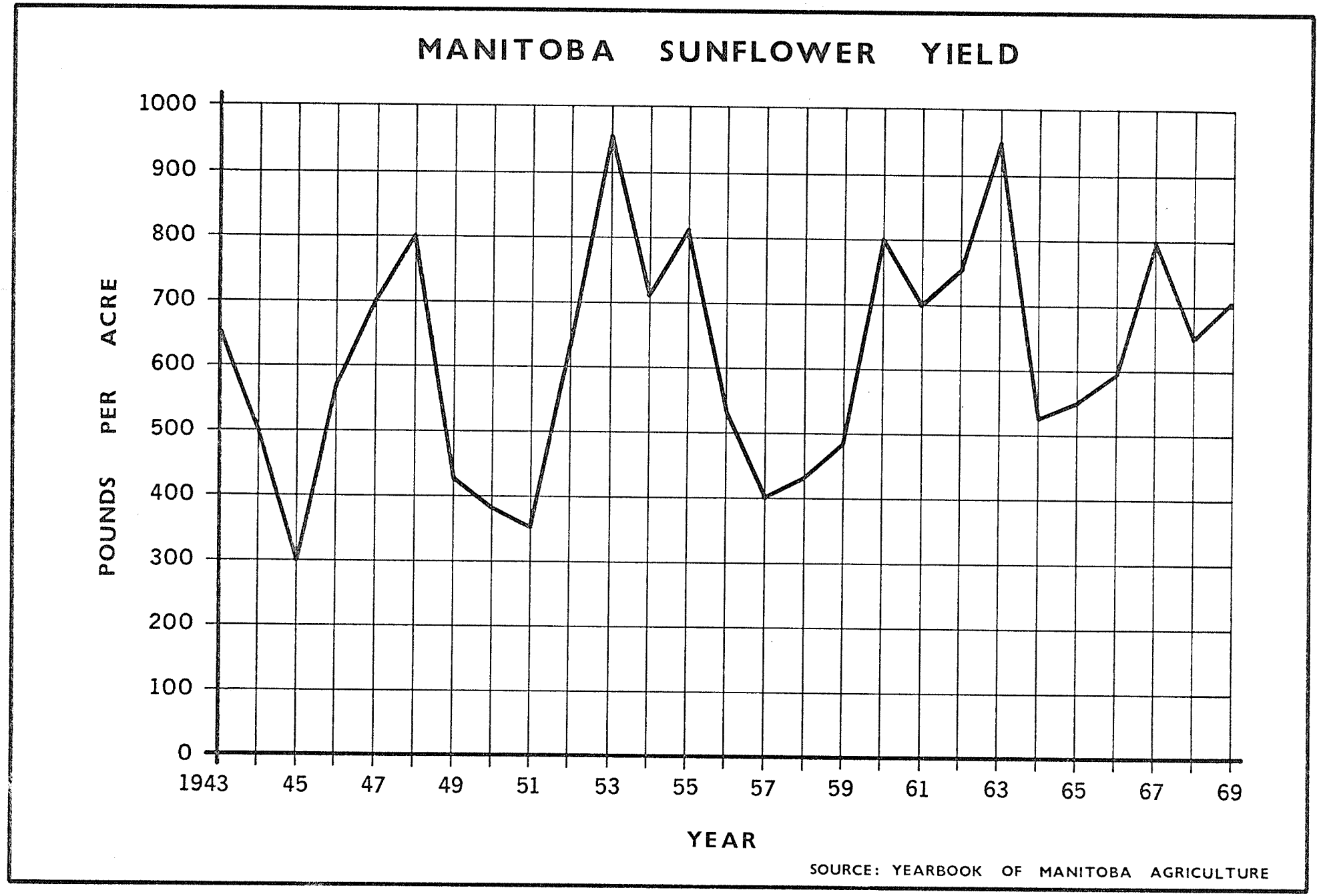
MANITOBA SUNFLOWER YIELD
POUNDS PER ACRE
1000
900
800
700
600
500
400
300
200
100
0
1943
45
47
49
51
53
55
57
59
61
63
65
67
69
YEAR
SOURCE: YEARBOOK OF MANITOBA AGRICULTURE

FIGURE 21

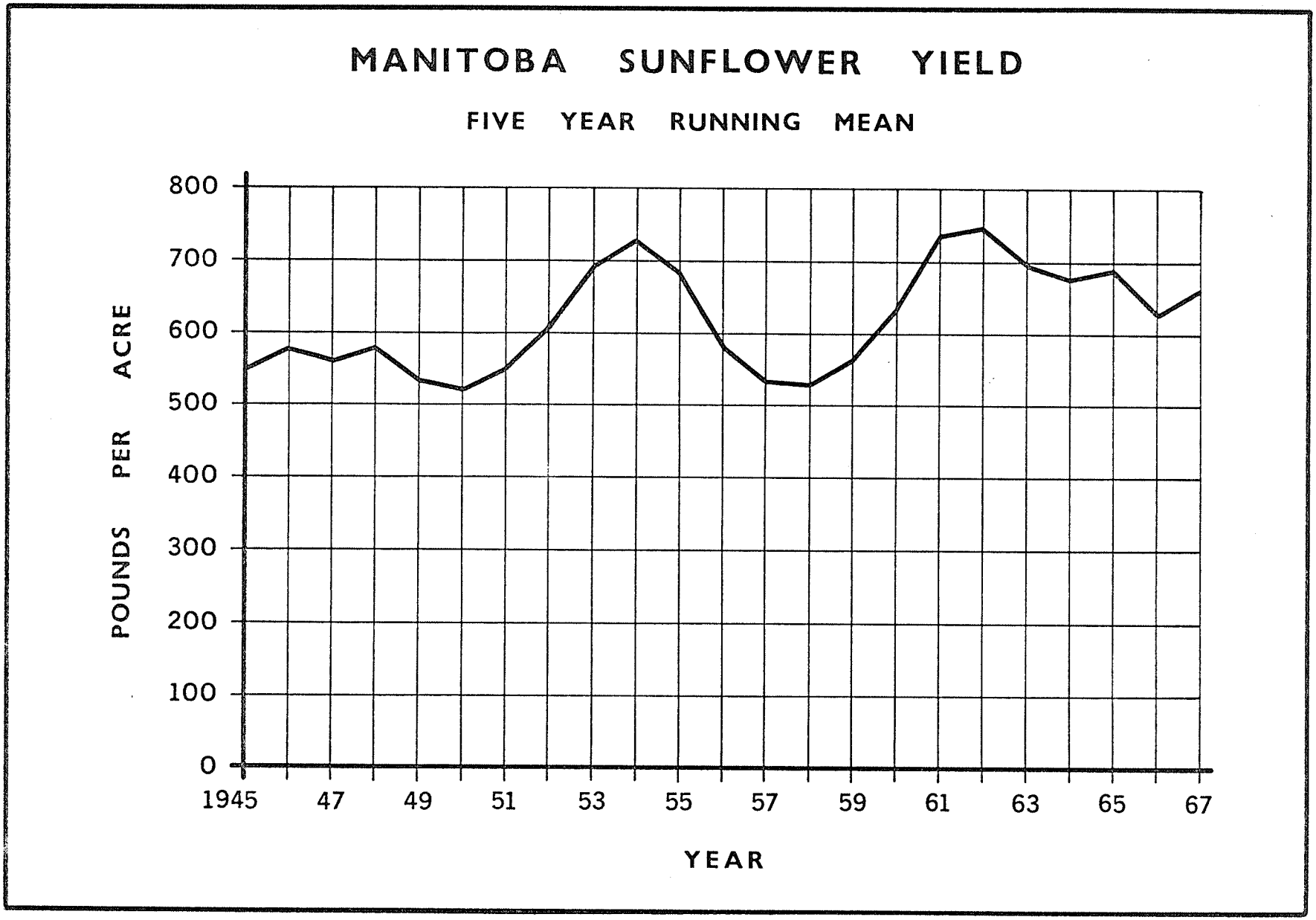
MANITOBA SUNFLOWER YIELD
FIVE YEAR RUNNING MEAN
POUNDS PER ACRE
800
700
600
500
400
300
200
100
0
1945
47
49
51
53
55
57
59
61
63
65
67
YEAR

FIGURE 22

Peredovik	-	15¢
Armavirec	-	15¢
Krasnodarets	-	15¢
Valley hybrid	-	35¢
Commander	-	15¢

The price for Valley planting seed is higher than the others because its production requires more labour and equipment than the open pollinated seed of the other varieties.[7]

The contract establishes a minimum initial price to be paid to the grower (item three in contracts, Appendix A) Two supplementary payments usually follow, called respectively the interim and final, to give a gross price on the seed. The ultimate total price paid depends on the processing costs and the average selling price obtained by CVO for the products. The gross price over the last 25 years has fluctuated from 3.7 to 6.0 cents per pound as illustrated in Table IX.

Utilizing both the yield per acre and price per pound in Table IX, it will be noted that the average gross return per acre in some years has been remarkable e.g. 1948 - $44.80, 1963 - $41.80. The production costs involved will also vary amongst growers although one study

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[7] Based on personal correspondence between Mr. Peter Bergen, Field Representative, Co-op. Vegetable Oils Ltd., Altona and the writer, July 9, 1969.

TABLE IX

Yield Per Acre, Price Per Pound, and Gross Dollar Return Per Acre - 1943 to 1969

Year	Yield Per Acre (pounds)	Price Per Pound (dollar)	Gross Return Per Acre (dollar)
1943	650	.045	29.25
1944	500	.045	22.50
1945	300	.040	12.00
1946	565	.045	25.43
1947	700	.055	38.50
1948	800	.056	44.80
1949	425	.038	16.15
1950	380	.039	14.82
1951	351	.037	12.99
1952	633	.048	30.38
1953	952	.043	40.94
1954	710	.040	28.40
1955	812	.042	34.10
1956	532	.042	22.34
1957	400	.040	16.00
1958	430	.052	22.36
1959	480	.040	19.20
1960	800	.045	36.00
1961	700	.045	31.50
1962	750	.055	41.25
1963	950	.044	41.80
1964	525	.050	26.25
1965	550	.0575	31.63
1966	594	.060	35.64
1967	800	.045	36.00
1968	650	.050	32.50
1969	708	.050	35.40

Source: Manitoba Department of Agriculture, *Manitoba Agriculture 1969 Yearbook* (Winnipeg: Queen's Printer, 1970), p. 52.

reported that the average farm spent approximately $1,000 to grow sunflowers, which is 3.5 cents per pound.[8] Therefore in years of high yields sunflowers have been a remarkably remunerative crop. There is also the potential that this crop will bring even greater economic returns providing yields approach 1,000 pounds per acre on the average, and there are good indications that this yield will become a reality.

V. Foreign Imports

Trade relations between Canada and other nations have permitted foreign sunflower oil to enter Canada periodically at extremely low prices. At such times the Canadian sunflower growers and processors notice a marked disruption of their markets. This situation has caused sufficient concern amongst CVO officials to warrant their sending a number of briefs to the Government of Canada.

Over the years all the briefs have had a common, central theme. The directors of CVO believe that expansion of the sunflower industry in Canada is being curbed because of the low prices of imported competing oil.[9] They allege

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[8] L.R. Rigaux, *Economic Aspects of Sunflower Production in Manitoba*, Faculty of Agriculture and Home Economics, Research Report No. 6, March, 1960 (Winnipeg: University of Manitoba, 1960), pp. 15, 21.

[9] Co-op. Vegetable Oils Ltd., "Brief to the Chairman of the House of Commons Special Standing Committee on Agriculture," (Altona: Co-op. Vegetable Oils Ltd., April 19, 1969), p. 3. (Mimeographed.)

that the low prices at which Canadian users are able to import such oils are unrealistic in view of the costs incurred to grow and process the seed and therefore such suppliers are either subsidizing the growers or "dumping" surpluses.[10] Further, because processing plants in the Canadian west handle a variety of products, their operating costs are higher, thereby adversely affecting the profit margin and selling price.[11] CVO and possibly other Canadian processors are unable to compete with the low prices of imported oil and, consequently, an instability in sunflower acreage occurs. To counteract such situations and stimulate Canadian sunflower acreages, CVO contends that some form of import control should be instituted.

It would appear that some form of protection is required by the Canadian sunflower oil industry even though it has survived without such benefits in the past. In view of the large quantities of sunflower oil being imported into Canada, 34 million pounds in 1967 and over 40 million pounds in 1968, the Canadian industry has not reached that level of growth whereby it can compete with the larger foreign exporters.[12] Therefore the imposition of some

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[10] Co-op. Oils, "Brief to the Committee on Agriculture," *op. cit.*, p. 3.

[11] Co-op. Vegetable Oils Ltd. *et al.*, "Brief to the Hon. Walter L. Gordon, P.C., M.P.," (Altona: Co-op Vegetable Oils Ltd., December 8, 1964), p. 2. (Mimeographed.)

[12] Co-op. Oils, "Brief to the Committee on Agriculture," p. 1.

measures, such as tariffs, could stimulate Canadian sunflower acreages and regulate the importation of low priced oils.

CHAPTER VIII

VARIETIES

Since the establishment of sunflowers as a commercial crop in Manitoba in 1943, there has been a constant effort to develop improved varieties. This has resulted in the introduction of new varieties with the phasing out and eventual discontinuation of others. The new varieties normally display improvements in one or more traits which will upgrade the sunflower crop and ultimately the industry. These include greater disease resistance, higher oil content, earlier maturity and greater yield of seed. This chapter will discuss the varieties available and the distinctive features of each.

I. Oil Varieties

Currently all seed that is grown enters two fundamental markets. Each market requires its own special seed. The princial market utilizes the sunflower oil and consumes 90 percent of all seed produced. The other, known as the special foods market, is presently one of limited demand.

With respect to the oil market, four seed varieties are currently recommended. They are Peredovik, Armavirec, Valley and Krasnodarets.[1] Peredovik was developed in Russia and licensed in Canada on February 24, 1964.[2] The oil content of the seed varies from 43.6 to 45 percent, the highest of all varieties.[3] This quality led to the displacement of other oilseed varieties, such as Advent, and is responsible for its widespread popularity. The variety is resistant to leaf mottle, moderately susceptible to downy mildew and susceptible to rust.[4] It grows to a height of four to six and one-half feet and produces seed of medium size, black in colour with narrow dark-grey stripes.[5] It yields between 1,300 and 1,595 pounds per acre and like Valley matures in 128 days.[6]

Armavirec was licensed in Canada in 1966 after being introduced from Russia.[7] The oil content is 41 percent,

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[1] P. Bergen, "Sunflower Production Guidelines for 1969," (Altona: Co-op. Vegetable Oils Ltd., 1969), p. 1. (Mimeographed.)

[2] Eric D. Putt, "Sunflower Variety Peredovik," *Canadian Journal of Plant Science*, XLV (March, 1965), p. 207.

[3] *Ibid.*; see also Bergen, *op. cit.*, p. 1.

[4] Putt, *op. cit.*, p. 207.

[5] Eric D. Putt, *Sunflower Seed Production*, Canada Department of Agriculture, Publication 1019 (Ottawa: Queen's Printer, 1967), p. 20.

[6] Putt, "Sunflower Variety Peredovik," p. 207; see also Bergen, *op. cit.*, p. 1.

[7] Putt, *Sunflower Seed Production*, p. 20.

just slightly below Peredovik.[8] It is also resistant to leaf mottle and susceptible to rust.[9] Although the yield is 20 percent less than Peredovik it matures ten days earlier, and this makes it popular where the frost free season is critical or when late seeding is necessary.[10]

Valley hybrid, licensed in 1968, was developed at the Canada Department of Agriculture Research Station in Morden.[11] The outstanding features of this variety are its large yields, rust-resistance and toleration of Verticillium wilt.[12] Tests have revealed that the oil content of Valley, at 40 percent, is approximately five percentage points lower than Peredovik although the yield, at 2,017 pounds per acre, is about 25 percent larger than Peredovik.[13] With a plant height of 67 inches, Valley is the tallest of all varieties.[14] Because of its late maturity, 128 days, Valley is recommended only in the Red River Valley.[15] Further, its rust resistance is a positive

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[8] Putt, *Sunflower Seed Production*, p. 20.

[9] *Ibid.*

[10] *Ibid.*

[11] Bergen, "Production Guidelines for 1969," p. 1.

[12] Bergen, "Production Guidelines for 1969," p. 1; also personal letter from Mr. Peter Bergen, Field Representative, Co-op. Vegetable Oils Ltd., Altona to writer, July 28, 1969.

[13] Bergen, "Production Guidelines for 1969," p. 1.

[14] *Ibid.*

[15] Personal correspondence between Dr. Eric D. Putt, Director, Research Station, Canada Department of Agriculture, Morden and the writer, April 19, 1972.

asset for this area because rust is a greater hazard in the Red River Valley than in other parts of the province.[16]

Krasnodarets was developed at Krasnodar in southern Russia and introduced to Manitoba in May, 1969.[17] It is rated similar to Armavirec in most respects but tends to yield approximately one-sixth more. It also has a slightly greater oil content.[18]

The acreages planted to each variety vary considerably, as is evident from Table X. Krasnodarets and Peredovik have the greatest acreages because of their high oil content and good yields. Krasnodarets will likely replace Armavirec completely because of its superior yield. Although Valley currently has a small acreage, it is conceivable that this acreage could expand should rust be become a factor as it is the only variety that is rust-resistant.

II. Special Foods Variety

The special foods market, which includes the confectionary and bird feed trade, is very limited, absorbing only ten percent of the crop. There is at present only one

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[16] Personal correspondence between Dr. Eric D. Putt and the writer, April 19, 1972.

[17] Personal correspondence between Mr. Peter Bergen and the writer, July 9, 1969.

[18] Canada Department of Agriculture Research Station, "Krasnodarets" (Morden, June 20, 1968). (Mimeographed.)

TABLE X

Contracted Acreages for 1969

Variety	Acreage
Peredovik	17,215
Armavirec	7,465
Valley	905
Krasnodarets	20,965

Source: Co-op. Vegetable Oils Ltd., "Distribution of Sunflowers Contracted in Manitoba as of June 1, 1969," Altona. (Mimeographed.)

variety in this category, called Commander. Licensed in February 1964, it was developed mainly to produce higher yields of large seed.[19] It has a low oil content, approximately 28 percent, but as oil production is not the prime requirement, this poses no problem.[20] Commander is susceptible to rust, downy mildew and Verticillium wilt or leaf mottle.[21]

These varieties in both the oil and special foods groups are those that are recommended for 1969. Many varieties have preceded these and have been discontinued for different reasons. The varieties which replace them have always brought improvements as this is a prerequisite to the granting of a license in Canada. In view of the recent introduction of all these varieties, which is verified by the licensing dates, it would appear that they will continue to be recommended for a few years before being superceded by others with more desirable qualities.

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[19] Eric D. Putt, "Sunflower Variety Commander," *Canadian Journal of Plant Science*, XLV (March, 1965), p. 208.

[20] Putt, *Sunflower Seed Production*, p. 22.

[21] Putt, "Sunflower Variety Commander," p. 208.

CHAPTER IX

RESEARCH

Research has always been a fundamental part of the sunflower program in Manitoba. Although this research takes many forms and directions, the common objective is the improvement of the provincial sunflower industry. This may be accomplished by introducing or developing higher yielding varieties for the Manitoba environment and by determining which cultural practices will provide the optimum response.

The people responsible for introducing a comprehensive research unit in Manitoba were the directors and personnel of the CVO plant. Because of the dearth of information on sunflowers applicable to Manitoba conditions, CVO in 1947, just one year after commencing operations, opened a sub-division known as "The Agronomy and Field Service Department."[1] This department, administered by Dr. Eric Putt, an employee of CVO, was by 1949 recommending varieties, seeding rates, row spacings, seeding dates and fertilizer

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[1] Co-op. Vegetable Oils Ltd., *A Tour Through the Plant of Co-op. Vegetable Oils Ltd. Altona, Manitoba* ([n.p.]: [n.n.], [n.d.]), p. 12.

practices.[2]

Since the early years of the 1950 decade, the functions of CVO's research department have been transferred to the Government of Canada, which expanded its sunflower research project at the Experimental Farm, Morden, when it became clear that this crop was established in the province. The sunflower research at Morden has been under the direction of Dr. Putt since 1953, when he was engaged from CVO, to January 1966, when Dr. Henry Enns took control.[3]

Although there are many facets to the research carried on in Manitoba, most of it may be grouped into three general categories - development of new varieties, testing of varieties from other countries and plant response to fertilizer - each of which will be dealt with in this chapter. A brief account will also be given on the research into insect control, although this program has been suspended.

I. New Varieties

An extensive breeding program has been conducted at Morden since 1945.[4] The purpose of this project has been to develop new varieties suitable to the Manitoba environment

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[2] Co-op. Oils, *op. cit.*, p. 12.

[3] *Co-op. Vegetable Oils Ltd.* ([n.p.]:[n.n.], 1969), p. 6.

[4] Eric D. Putt, "Sunflower Breeding in Canada," Paper presented to the First International Sunflower Conference June 17-18, 1964 (College Station: Texas A&M University). (Mimeographed.)

with such desirable qualities as earlier maturity, higher oil content, greater seed weight and resistance to disease.

The initial breeding program was oriented toward disease resistance, particularly after the serious rust epidemic which occurred in 1951.[5] The rust was a major factor in reducing acreage from 60,000 in 1949 to an all-time low of 3,000 in 1952 (Figure 10). At that time the cause of the rust epidemic was unknown. It is now believed that the acreage was so concentrated that it favored rapid development of the disease during a period of weather ideally suited to propagation of the pathogen.[6] The urgency of the situation forced research to be directed towards developing a variety resistant to rust. The researchers investigated the possibility of transferring a rust-resistant characteristic discovered in a wild plant in 1949 to a commercial variety.[7] A scheme of this nature requires several generations and to speed up the program two winter crops were grown in Chile, South America.[8] In late 1954 success was achieved with the licensing of the rust-resistant Beacon variety.[9] Subsequent research led to the release of

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[5] Putt, *op. cit.*, p. 1.

[6] Personal correspondence between Dr. Eric D. Putt, Director, Research Station, Canada Department of Agriculture, Morden and the writer, April 19, 1972.

[7] Putt, *op. cit.*, p. 1.

[8] Co-op. Oils, *A Tour Through the Plant*, p. 12.

[9] *Ibid.*

the rust-resistant varieties Advent in 1959 and Admiral in 1960.[10] The latter two varieties were superior to Beacon because they matured earlier and had a higher oil content.[11] The variety Valley was also developed through a breeding program at Morden. Released in 1968, this variety combines rust-resistance and high yields.[12] Its rust-resistance and late maturity lead to its recommendation for production in the Red River Valley only. In recent years breeding emphasis has shifted from disease resistance to higher oil content.[13]

A program to develop large seed for use in the special foods trade has been administered at Morden since 1956.[14] This project has produced the Commander variety which was licensed in February 1964.[15]

A significant part of the research has been published in agricultural journals. The diversity of the Morden program becomes apparent on examination of the topics involved - recessive branching, hybrids and synthetics, male sterility, susceptibility to sclerotina wilt,

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[10] Putt, *op. cit.*, p. 2.

[11] *Ibid.*

[12] P. Bergen, "Sunflower Production Guidelines for 1969" (Altona: Co-op. Vegetable Oils Ltd., 1969), p. 1. (Mimeographed.)

[13] Putt, *op. cit.*, p. 1.

[14] *Ibid.*, p. 6.

[15] Eric D. Putt, "Sunflower Variety Commander," *Canadian Journal of Plant Science*, XLV (March, 1965), p. 208.

resistance to leaf mottle disease and sunflower rust.

II. Seed Testing

A major phase of the research program at Morden is oriented to introducing and evaluating varieties developed in other countries to determine their adaption to the Manitoba environment. Experiments with these varieties are conducted at a number of test sites which normally include the varieties currently being grown in Manitoba for comparison. Once the data are obtained and analyzed, recommendations are then made to either accept or reject the tested varieties. Examples of varieties which have most recently been licensed and as a result of this work approved for Manitoba include Peredovik, Armavirec, and Krasnodarets.

Table IB in Appendix B is an example of a data summation sheet. The numerous characteristics on which information has been compiled indicates the features that interest the researcher and also the depth of the examination procedures. The data on yield are also included in Appendix B (Table IIB). Note that all varieties performed well and although Valley has a lower oil percentage, it yielded much higher than the others.

III. Fertilizer Response

Research is being conducted by the Soil Science Department at the University of Manitoba on the response of sunflowers to fertilizer. This project, currently under the guidance of Dr. G.J. Racz, tests various fertilizer combinations on differing soil types. When the data from the tests have been compiled and analyzed, recommendations are made for fertilizing sunflowers.

Research has demonstrated that in most instances sunflower yield increases with application of the correct fertilizer. Tests have revealed that the introduction of nitrogen fertilizer has resulted in "... small but consistent increases in seed yield."[16] It has also been discovered that applications of nitrogen and phosphorous fertilizers do augment yields if the soil is deficient in these elements.[17]

Supporting evidence of a positive response through the addition of phosphorous and nitrogen is supplied in Table XI. Experiments of this nature have led to the recommendation that 20 to 30 pounds of phosphorous and

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[16] G.J. Racz, "Effect of Fertilizers on Corn and Sunflower - 1968" (Winnipeg: University of Manitoba, Department of Soil Science), p. 1. (Mimeographed.)

[17] Faculty of Agriculture and Home Economics, University of Manitoba, *Principles and Practices of Commercial Farming* (Winnipeg: University of Manitoba, 1968), p. 67.

TABLE XI

Effect of Phosphorous and Nitrogen Fertilizer on Sunflowers

	Pounds acre	Yield cwt/acre
Phosphorous	0	16.9
	20	18.3
	40	18.8
Nitrogen	0	13.4
	30	15.6
	60	18.3
	90	19.2

Source: Faculty of Agriculture and Home Economics, University of Manitoba, *Principles and Practices of Commercial Farming* (Winnipeg: University of Manitoba, 1968), p. 67.

40 to 60 pounds of nitrogen be sidebanded with the seed.[18] Potassium should not be added unless a soil test indicates a shortage of this nutrient.[19]

IV. Insect Control

Dr. P.H. Westdal at the Research Station of the Canada Department of Agriculture in Winnipeg, conducted a research program on sunflower insects from the latter part of the 1940 decade to the middle of the 1950 decade.[20] In broad terms this work identified those insects which were harmful to sunflowers in Manitoba, determined the extent of their damage and ascertained the best methods to control them. The field work was carried out in the Altona district from the former Dominion Entomological Laboratory at Brandon.

Recommending the most effective and economical insect control constituted a major phase of the program. This involved testing and analyzing the results of chemical, cultural and biological methods of control. Chemicals were found to be effective against many of the insect pests, but the cost of application and the possible harm to

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[18] Faculty of Agriculture, *op. cit.*, p. 67.

[19] *Ibid.*

[20] Information pertaining to insect control in this subsection was obtained during a personal interview with Dr. P.H. Westdal, May 25, 1972.

pollinators were considered to be prohibiting factors in some cases. Some cultural practices, particularly deep fall plowing, were shown to be of value in destroying larvae of certain pest species in the soil, although in some instances the degree of success was nullified as natural parasites were also killed. One aspect of biological control involves the determination of the effectiveness of parasites in limiting pest populations and the possible manipulation of some factors to increase effectiveness. It was found that some of the most destructive pests were generally kept in check by natural enemies and so control by chemical means was not encouraged. When insect populations increased so that they became detrimental to a sunflower crop, it was found that within a short time the number of parasites also increased to reimpose a stable relationship. Although there are exceptions, Dr. Westdal's research indicated that natural control by parasites is, over a period of time, the most effective. This program is now terminated.

Therefore an excellent sunflower research program is being conducted in Manitoba. The major portion of the research is administered by the Research Station of the Canada Department of Agriculture, formerly termed the Experimental Farm, at Morden. It concentrates on the development of improved varieties and the introduction and testing of varieites from other countries. The University of Manitoba's fertilizer research program is also of vital

importance. The successes of all research projects, including those of the discontinued insect control program, have contributed significantly to the growth and continuance of sunflowers in the province.

CHAPTER X

FINAL PRODUCTS

The prime function of the CVO plant at Altona is to extract oil from oil-bearing seeds. The seeds which are currently being processed are Canadian grown sunflowers and rapeseed and imported soybeans from the United States. A secondary role is to convert any residue into marketable products, the most significant being meal. This chapter will trace the stages involved as the seed is processed, the products that are obtained and their distribution to markets.

I. Oil Extraction

The Altona plant was built to process sunflowers grown in the surrounding area. However, this acreage had never been sufficient to sustain the operation of the plant on a year-round basis. Even the largest acreage grown in one year has only required approximately one hundred days for processing.[1] By way of contrast, the low acreage in

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[1] Co-op. Vegetable Oils Ltd., *Twelfth Annual Report 1955* (Altona, 1955), p. 11.

1952 produced only 1.8 million pounds of seed which required just 17 days to crush.[2] Therefore to retain experienced staff and keep the plant operating as much as possible throughout the year, thereby making it an economically viable enterprise, the directors realized the need to process other oilseed crops. The crops selected were soybeans, which have been imported from the United States since 1950, and Canadian grown rapeseed.[3] The organization conducted some local research with safflower in the expectation that it also would be adaptable to the environment and suitable for processing. While early results were promising, trial commercial plantings were not successful and the work was suspended until better varieties could be obtained.[4]

Table XII shows the plant schedule for processing sunflowers, soybeans and rapeseed at selected years. It is obvious that although sunflowers have always had priority over other crops for processing, they have never held first position in length of processing run. Therefore, in all probability, without rapeseed and soybeans the success of the plant would have been seriously impaired and the organization might have gone bankrupt.

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[2] Co-op. Vegetable Oils Ltd., *Annual Report for the Year Ending July 31, 1954* (Altona, 1954), pp. 4, 6.

[3] Co-op. Vegetable Oils Ltd., *Sixteenth Annual Report* (Altona, 1959), p. 5.

[4] Personal communication with Dr. E.D. Putt, Director, Research Station, Canada Department of Agriculture, Morden, and the writer, August 17, 1972.

TABLE XII

Time Required for Processing

Year	Total Operation Days	Sunflowers	Soybeans	Rapeseed
1966	325	60	220	45
1965	332	96	219	17
1963	342	10	242	90
1960	333	36	269	28
1955	294	100	132	60
1954	317	43	247	27

Source: All data obtained from the Annual Reports of Co-op. Vegetable Oils Ltd., Altona.

The major steps involved in the processing operation are briefly outlined in the subsequent paragraphs with the processing sequence diagrammed in Figure 23. Although the steps generally apply to all oil-bearing seeds handled by the plant, the information pertains directly to sunflowers.[5]

1. On arrival at the receiving elevator, the seed is cleaned. This involves the removal of all foreign material such as portions of the head and stem or weed seeds.

2. The seed is then dried to a moisture content of approximately eight percent and stored until the plant begins a sunflower run.

3. When the run commences, the seed is transported from storage to a grinder which breaks up the hulls in the dehulling process. The hulls are then drawn off by suction, hauled away and finally burned.

4. The dehulled kernels, now called meats, then enter the cooker and conditioner unit which prepares them for oil removal.

5. The conditioned meats enter a screw press expeller where approximately two-thirds of the oil is squeezed out. This oil is then pumped through filters which trap any physical impurities and thence to storage tanks for crude oil.

6. The remaining oil in the residue at the expeller is

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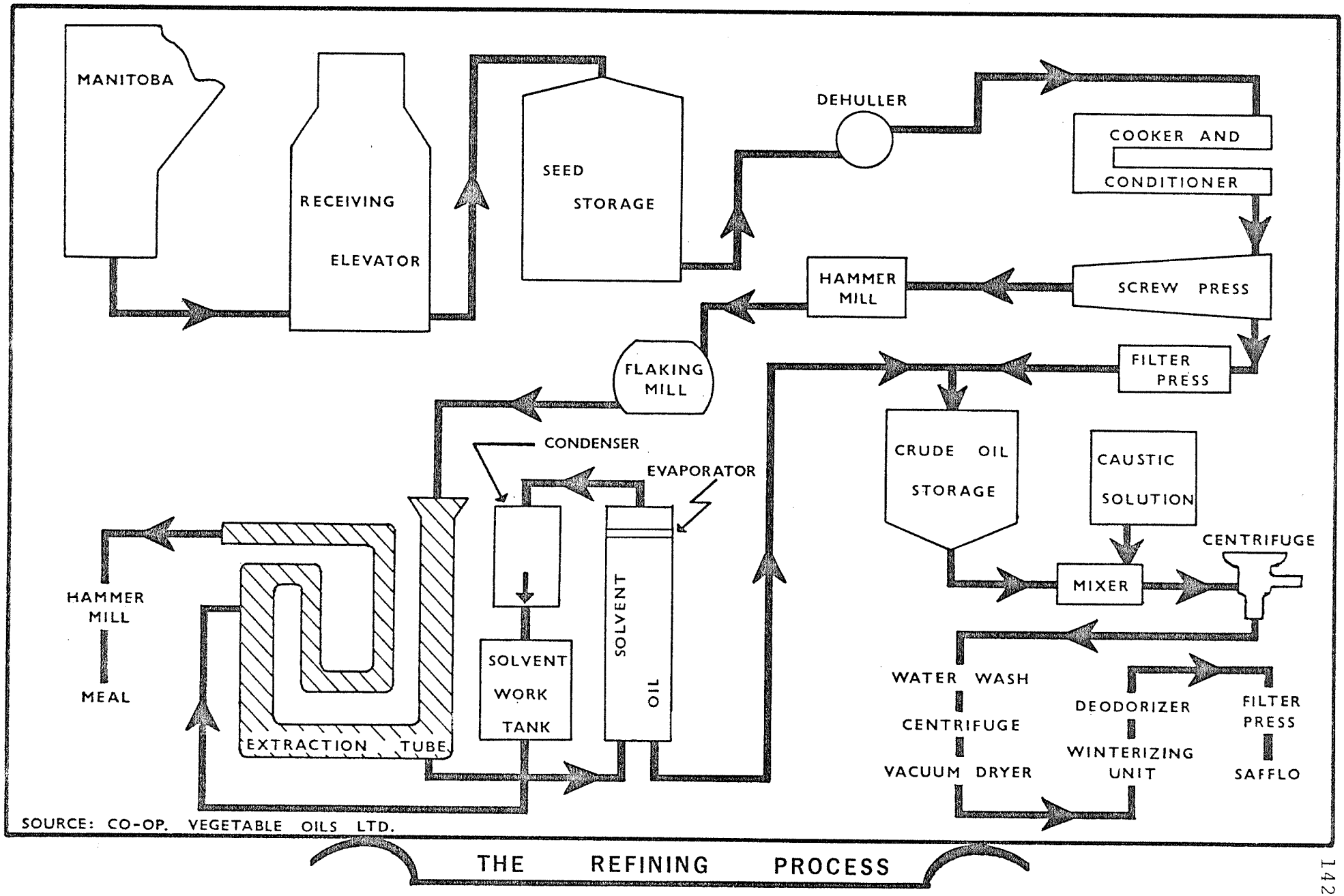
[5] The primary source of information concerning the processing operation is a pamphlet from: Co-op. Vegetable Oils Ltd., *Processing Edible Oil Seeds* (Altona: [n.n.], [n.d.]).



THE REFINING PROCESS

FIGURE 23

removed by a solvent extraction process. This oil-bearing residue is first conveyed to the hammer mill where it is ground into coarse particles. These are transmitted to the flaking mill, rolled into flakes, and passed on to the solvent extractor.

7. At the solvent extractor, the oil in the flakes is dissolved in the solvent.

8. Subsequently, the flaked material moves through a series of desolventizing tubes to a rotary toaster which dries the material. It is then transferred by air to a hammer mill which grinds it into meal. This is sold as animal feed.

9. Coincident with this process, the oil and solvent in solution are separated from each other. This is feasible as the solvent has a lower boiling point than the oil which permits the recovery of the solvent by evaporation. The solvent-free oil is then pumped into the same oil storage tanks as the oil obtained from the screw press expeller.

10. The crude oil contains free fatty acids. These are removed by caustic refining, a method which involves treating the oil with a sodium hydroxide solution. This solution reacts with the fatty acids to produce a soaplike substance, called soapstock, which is drawn off by centrifuges and washing with water.

11. The crude oil also contains stearines or waxes which are extracted by "winterizing". The oil is first pumped

through a cooling unit to solidify the stearines in the oil and then through a filter press to extract the solid stearines. Next, steam distillation removes the sunflower odor and finally the oil is filtered to ensure its absolute purity prior to packaging.

These are the basic steps associated with the oil extraction process. Each step is designed to assure that quality products are available at competitive prices.

II. Products and Markets

There are three fundamental products obtained from sunflower seed at the present time. These are crude oil, refined oil and meal.

The plant was equipped to produce only crude oil in its initial years of operation. From 1945 to 1950, the six crops produced almost 26 million pounds of crude sunflower oil which, as is the case today, was sold to refining and packing house firms.[6] The bulk of this oil was refined by the purchasers and sold as salad and cooking oil. By the 1950 crop, CVO had installed refining equipment and began offering refined oil in containers to the grocery trade and other sales outlets.

At present the market for the crude and refined oil, sold in both bulk and drum lots, is in the metropolitan

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[6] Eric D. Putt, *Sunflower Seed Production* (Rev. ed.; Altona: Co-op. Vegetable Oils Ltd., 1952), p. 28.

cities of Toronto and Montreal where almost 95 percent of such oils are consumed.[7] A portion of the refined oil is packaged at CVO and sold under the trade name of Safflo. The Safflo product, which normally constitutes approximately 20 percent of the total sunflower oil sales, is sold in western Canada mainly in the provinces of Manitoba and British Columbia.[8] It is packaged in cans containing either 24, 48 or 128 ounces. Although used primarily as a salad and cooking oil, its exceptional qualities also make it one of the best liquid shortening available.

Some of the refined oil is also packaged at CVO for the Interprovincial Co-operatives Ltd. under the brand name Co-op. Salad and Cooking Oil. This oil, identical to Safflo, is sold to Co-op. stores from Toronto to Vancouver.[9]

The sunflower oil may be disposed of in any of three markets, depending upon the demand. These are crude oil, refined oil and oil packaged as Safflo. Table XIII indicates the sales of these oils processed at CVO from 1958 to 1968. The most outstanding trends during this period are the continuous increase in the consumption of Safflo and the greater production of refined oil. This

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[7] Information in a letter from P. Bergen, Field Representative, Co-op. Vegetable Oils Ltd., Altona to the Agricultural Stabilization Board, Ottawa, February 6, 1968.

[8] Co-op. Vegetable Oils Ltd., *Co-op. Vegetable Oils Ltd.* ([n.p.]: [n.n.], 1969), p. 14.

[9] Co-op. Vegetable Oils Ltd., *A Tour Through the Plant of Co-op. Vegetable Oils Ltd. Altona, Manitoba* ([n.p.]: [n.n.], [n.d.]), p. 16.

TABLE XIII

Product Sales

Year Ending July 31	Crude Oil (pounds)	Refined Oil (pounds)	Safflo in Cans (pounds)
1958	7,220	1,204,700	329,304
1959	6,920	1,228,030	387,651
1960	107,460	2,064,415	389,501
1961	2,245	1,424,845	340,134
1962	3,809	794,630	551,342
1963	1,268	226,935	838,603
1964	1,098,143	2,494,455	874,758
1965	305,545	5,603,460	814,811
1966	61,386	3,193,255	935,625
1967	138,328	3,550,365	1,026,991
1968	3,680,089	4,777,208	1,072,335

Source: All data obtained from Co-op. Vegetable Oils Ltd., Atlona.

indicates a wider acceptance of sunflower oil.

The main by-product is sunflower meal. It consists of solid, oil-free residues which are processed through a hammer mill and bagged for sale. The meal produced before installation of the solvent process contained 40 to 50 percent protein and five percent fat.[10] With the solvent process, the fat content is reduced to approximately one percent.[11] The meal has found markets in feed mixing plants who use it as a concentrate in making livestock feed, especially for the dairy and poultry trade.

Table XIV gives the gross dollar value of both sunflower oil and meal for the ten years 1958 to 1967. The value of both products has roughly trebled over this period, denoting increased demand and a progressive plant operation. Note also that the oil and meal have maintained a stable relationship of approximately 84 and 16 percent, respectively, to the total gross value.

CVO also markets seed for the specialty food trade and for bird seed. Sales in the bird food trade have been directed to the United States and western Europe, with exports in 1968 at approximately 2.5 million pounds.[12]

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[10] Putt, *Sunflower Seed Production*, p. 29.

[11] Personal communication with Dr. E.D. Putt and the writer, August 17, 1972.

[12] Personal correspondence between P. Bergen, Field Representative, Co-op. Vegetable Oils Ltd., Altona and the writer, July 9, 1969.

TABLE XIV

Gross Value of Sunflower Oil and Meal Production

Year ending July 31	Oil	Meal	Total	Percent of Total Gross Value Oil	Meal
1958	330,481	62,847	393,328	84.0	15.9
1959	351,877	65,167	417,044	84.3	15.6
1960	359,292	69,591	428,883	83.7	16.2
1961	338,912	59,202	398,114	85.1	14.9
1962	296,820	49,234	346,054	85.7	14.2
1963	152,964	27,211	180,175	84.8	15.1
1964	758,791	163,578	922,369	82.2	17.7
1965	1,184,945	242,556	1,427,501	83.0	16.9
1966	879,960	141,652	1,021,612	86.1	13.8
1967	969,181	189,023	1,158,204	83.6	16.3
Total	$5,623,223	$1,070,061	$6,693,284	84.2	15.7

Source: All data obtained from Co-op. Vegetable Oils Ltd., Altona.

These products, however, do not form a significant portion of the total sales.

A unique industry grew out of a vexing problem of disposing of the sunflower hulls. During the first years of operation the hulls became a problem as the supply grew with few outlets available for their removal. Although some use had been found as a chick litter and as a roughage and bedding for livestock, such demands were not great enough to absorb the supply and they continued to accumulate. Because they presented a fire hazard, it was necessary to remove them from the premises. This was a costly procedure.

Experiments were conducted to process them into a useful product acceptable in consumer markets. Tests were undertaken utilizing the hulls as a wallboard and also as an insulating material, both of which were unsuccessful. It was discovered, however, that a potential outlet existed as a fuel. Successful tests were carried out in Idaho which led to the rental of machines to convert the hulls into a fuel product.[13]

These machines compressed the hulls into a log approximately four inches in diameter, twelve and one-half inches in length and weighing seven and one-half pounds.[14] The logs found ready acceptance as they have a higher B.T.U. value per pound than lignite coal.[15] Other favorable

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[13] Co-op. Oils, *A Tour Through the Plant*, p. 5.

[14] Putt, *Sunflower Seed Production*, p. 29.

[15] Co-op. Oils, *A Tour Through the Plant*, p. 17.

characteristics were the small amount of residue, approximately one-quarter that of coal, the small amount of smoke produced and the clean handling.

The logs were widely used in cooking stoves, furnaces and fireplaces. The demand for these "Pres-to-logs" was so great that capacity was increased. On an average day as many as 5,000 logs were produced.[16] In six years over 14,000 tons of hulls were converted into 3.5 million logs.[17]

On September 23, 1964, the pres-to-log building and machines were destroyed by fire at a loss of $35,000.[18] This phase of the operation was not renewed because the market had subsided due to the rural electrification program which replaced the coal and wood burning furnaces with electric stoves and oil furnaces. Therefore the destruction of the log plant and the subsequent decision not to rebuild climaxed the only industry in the world which produced such logs from sunflower hulls. Further it demonstrates how technological changes can affect markets. At present the hulls are hauled away and burned.[19]

To summarize, CVO processes sunflower seed into a variety of marketable products, the most significant being

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[16] Co-op. Oils, *A Tour Through the Plant*, p. 5.

[17] *Ibid.*

[18] Co-op. Vegetable Oils Ltd., *21st Annual Report 1964* (Altona, 1964), p. 13.

[19] Personal correspondence between P. Bergen and the writer, July 9, 1969.

refined oil. The sales value of the oil and meal have increased substantially during recent years, indicating greater consumer acceptance. This trend should continue as long as prices are competitive, since the quality is unsurpassed.

CHAPTER XI

SUMMARY AND CONCLUSIONS

The commercial sunflower is well-known in many parts of the world, mainly because of its impressive size in terms of height and head diameter. The oilseed varieties account for the major portion of the world production. This oil, designated as an edible vegetable oil, has many applications because of its outstanding culinary qualities. The seed also furnishes a valuable by-product, meal, which is utilized as a livestock feed.

World production is dominated by the U.S.S.R. That of North America is insignificant as a percentage of the world total. In the United States, sunflower acreages have increased in recent years, particularly in Minnesota and the Dakotas. The Canadian acreage after considerable fluctuation showed a degree of stabilization in the middle of the 1960 decade. This acreage is concentrated in the province of Manitoba.

Sunflowers were first grown in Manitoba on a commercial basis at the request of the Government of Canada during World War II because of the curtailment of overseas sources of vegetable oils. Although the acreage during the

war never remotely approached the Government's optimistic estimates, individuals in the Altona district were able to convert the idea of constructing a processing plant into a reality. This plant and the farmers who own it have been responsible for the continuance of sunflower acreages in the province. The plant today is efficiently operated with modern machinery, is financially sound, and its management enjoys cordial relations with the growers.

Research conducted by the personnel at the Research Station in Morden has, along with the processing plant, been a major instrument in perpetuating the sunflower crop in the province. They have advanced knowledge on proper cultural methods, developed, tested and introduced varieties suitable to the local environment and worked to control pests and diseases.

The Manitoba acreage is confined to the southern portion of the province in a semi-circle with the Red, Assiniboine and Souris Rivers approximating the boundaries. The highest densities occur in the southern portion of this region, focussing on the municipalities of Stanley, Rhineland, Roland, Thompson and Dufferin. The entire growing region is in the most advantageous location in the province in terms of temperature, frost-free season, precipitation and soils, with the high density or core area being slightly superior in these elements.

The selling price of sunflower seed, although

fluctuating from year to year, has not changed appreciably. Consequently the gross value per acre has remained relatively constant. However, this situation may be improved in the near future, since it is expected that new varieties under development will substantially increase yields.

Canadian sunflower oil receives no price subsidies or tariff protection. It is therefore subject to poor markets and surpluses when Canadian importers are able to purchase sunflower oil from foreign sources.

This study has shown that sunflowers in Manitoba, being at the northern limits of their adaption, are not in an environment suited to their optimum development. The challenge to establish the industry and overcome the various deficiencies has to a large extent been met within Manitoba.

There is every indication that the production of sunflowers should be encouraged by the Government of Canada and the Government of Manitoba as it contributes to the economic diversification of Manitoba. The vegetable oil demand is increasing in Canada and in view of the large amount of oil imported there is no question of markets. Canada should make every effort to cultivate any crop which would make the country less dependent upon foreign supplies. To encourage the continuation of sunflower acreages and if possible increase them, some form of protection should be instituted to guarantee the Manitoba producer and industry a minimum price level. This could take the form of either

tariffs or guaranteed prices. Since diversification is advocated by the Government of Canada in view of the surplus of cereal grains and difficulties in obtaining markets for them, some promotional program should be initiated to increase acreages.

With minor exceptions the data and conclusions in this study are valid to the beginning of 1970. Since that time the most outstanding changes in North America have occurred in acreage and research. The following paragraphs will briefly deal with these aspects and their importance.

Recent trends in the acreage and production of sunflowers suggest that some effective promotional work has been done and have given rise to optimistic predictions for the future of the industry in North America. Evidence in support of these views is available from several sources. The acreage in Minnesota has steadily increased from 64,000 in 1968, to 77,000 in 1969, to 86,000 in 1970.[1] North Dakota has a similar picture with 87,000 acres in 1968, 108,000 in 1969 and 126,000 in 1970.[2] In 1971 the combined total of sunflower plantings for both states was 405,000.[3]

The outlook is equally bright in Canada. Saskat-

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[1] Minnesota Department of Agriculture, *Minnesota Agricultural Statistics 1971* (St. Paul: [n.n.], March, 1971), p. 6.

[2] North Dakota Crop and Livestock Reporting Service, "Sunflowers" (Fargo: North Dakota Crop and Livestock Reporting Service, 1970). (Mimeographed.)

[3] J.R. Price, "Sunflower Seed" (Fargo: North Dakota Crop and Livestock Reporting Service, July 9, 1971). (Mimeographed.)

chewan planted approximately 65,000 in 1971 and it is estimated that this figure could go as high as 100,000 in 1972.[4] Alberta's acreage also increased in 1971 to 10,000 with a prediction of 25,000 for 1972.[5] Manitoba had an unprecedented 135,000 acres in 1971 and it is believed that there will be 205,000 in 1972.[6] Although this tremendous increase in acreages of the last few years is desirable and would appear to suggest that a new growth trend is beginning, it is, in the writer's opinion, somewhat premature to make any predictions based on such a short time span.

The discovery of a "restorer gene" by a United States Department of Agriculture scientist, Dr. M.L. Kinman, could in the near future have a considerable impact on sunflower acreages.[7] This finding lays the foundation to the possibility of a hybrid sunflower which may mean an increased yield of 30 percent over existing varieties with uniformity in maturity and height.[8] If this occurs, the acreage and production should, by all indications, expand remarkably.

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[4] Federal Grain Ltd., "Sunflower Seed - Saskatchewan" (Winnipeg: [n.n.], 1971). (Mimeographed.); also personal letter from D. Durksen, Director, Agro Information Division, Federal Grain Ltd., Winnipeg to the writer, March 2, 1972.

[5] Federal Grain Ltd., "Sunflower Seed - Saskatchewan,"; also personal letter from D. Durksen to the writer, March 2, 1972.

[6] *Winnipeg Free Press*, February 19, 1972, p. 8, col. 2.

[7] "Hybrid Sunflowers," *Country Guide*, October 1971, p. 32.

[8] *Ibid.*

Therefore, to conclude, this study has as its primary objective attempted to delve into the sunflower acreage, production and processing in Manitoba from its inception to the present day. The industry, although confronted with a variety of obstacles over the years, has managed to overcome them and still survive. It is the writer's belief and desire that the role the sunflower industry has played in the agricultural economy of the province will become more prominent.

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APPENDIX A

Co-op. Vegetable Oils Ltd.

ALTONA — MANITOBA

1969

STRIPED-SEED SUNFLOWER CONTRACT

agreement made between Co-op. Vegetable Oils Ltd., a company with head office at
a, in Manitoba (herein called the Co-operative) and:

.....
(Name of Grower)

..... (hereinafter called the Grower).
(Post Office Address)

WHEREAS the Co-operative has offered to market the Grower's sunflower seed production of varieties such as Commander pooling basis, and has agreed to make certain initial payments to the Grower and to provide the other services as set n this agreement, and the Grower has undertaken that he will deliver to the Co-operative all sunflower seed produced by of such varieties in the year 1969, which the Grower estimates as follows:

..... acres

above acreage being part of the following lands .....
(Land Description)

therefore this contract witnesseth in consideration of the premises and the mutual covenants and agreements herein ained:

The Co-operative agrees to sell to the Grower, and the Grower agrees to purchase, seed of Commander at $0.15 per pound. The Grower agrees to use this seed and no other for sowing the Grower's sunflower acreage to the Commander type variety in the year 1969.

The Grower agrees to deliver to the Co-operative for marketing by it all sunflower seed produced by him of the Commander ype variety in the crop year ending July 31, 1970.

The Co-operative agrees to accept delivery of all such sunflower seed at Altona, Manitoba, and to pay to the Grower at he time of delivery an initial payment of not less than $3.50 per 100 pounds on basis Grade No. 1 CW sunflower seed, subject to grade discount, and subject to dockage for foreign seeds and materials and for moisture in excess of 10 per cent.

The Co-operative shall operate a separate "pooling account" for seed of the Commander type variety.

The Co-operative may increase the rate of initial payment, as stated in paragraph 3, for Commander type sunflower seed as it may from time to time determine feasible.

The Co-operative may control the time of deliveries by imposing quotas on deliveries or by otherwise directing when deliveries shall be made, but on seed delivered after November 15, 1969 the Co-operative will pay the Grower in addition to the initial price an allowance for on-farm storage at the rate of approximately 4 cents per 100 pounds per month.

The Co-operative shall handle, process and market all such sunflower seed delivered to it at such a time, place, and manner as it shall in its discretion determine to be in the best interest of all the growers who have signed this and similar contracts.

The Co-operative shall deduct from the moneys received for the sale of all sunflower seed in each "pooling account" referred to in paragraph 4 the appropriate amount of initial payments paid to the growers together with charges for handling, storing, cleaning, processing, drying, marketing, and other services and charges to reserve. It shall distribute the remaining sum in each "pooling account" to the growers who delivered the respective types of sunflower seed to the Co-operative pursuant to this contract, and on a basis proportionate to the amount of seed delivered by each grower.

Any advances made to the Grower by the Co-operative in seed or otherwise shall constitute part payment for the sunflower seed grown and delivered, and the Grower agrees that the same shall be deducted from the initial or subsequent payments to him or shall be paid in cash. Interest at the rate of 4% shall be charged on any advances made under this contract.

In witness whereof this agreement has been executed by Co-op. Vegetable Oils Ltd. and by the Grower on

..... day of ..... 1969.

.....
Grower

OP. VEGETABLE OILS LTD.

: .....

Phone .....

C-No. .....

Co-op. Vegetable Oils Ltd.

ALTONA — MANITOBA

1969

OILSEED SUNFLOWER CONTRACT

agreement made between Co-op. Vegetable Oils Ltd., a company with head office at
na, in Manitoba (herein called the Co-operative) and:

.....
(Name of Grower)

..... (hereinafter called the Grower).
(Post Office Address)

WHEREAS the Co-operative has offered to market the Grower's sunflower seed production of the varieties such as Pere-
k, Krasnodarets, Armavirec and Valley on a pooling basis, and has agreed to make certain initial payments to the Grower
to provide the other services as set out in this agreement, and the Grower has undertaken that he will deliver to the
perative all sunflower seed produced by him of such varieties in the year 1969 which the Grower estimates as follows:

	ACRES
Peredovik	.....
Krasnodarets	.....
Armavirec	.....
Valley	.....
Total	.....

above acreage being part of the following lands .....
(Land Description)

' therefore this contract witnesseth in consideration of the premises and the mutual covenants and agreements herein
ained:

The Co-operative agrees to sell to the Grower, and the Grower agrees to purchase, seed of the variety or varieties re-
quired at the following rates per pound: Peredovik $0.15, Krasnodarets $0.15, Armavirec $0.15, Valley $0.35. The Grower
agrees to use this seed and no other for sowing the Grower's sunflower acreage of such varieties in the year 1969.

The Grower agrees to deliver to the Co-operative for marketing by it all sunflower seed produced by him of such varieties
in the crop year ending July 31, 1970.

The Co-operative agrees to accept delivery of all such sunflower seed at Altona, Manitoba, and to pay to the Grower at
the time of delivery an initial payment of not less than $3.50 per 100 pounds on basis Grade No. 1 CW sunflower seed,
subject to grade discount, and subject to dockage for foreign seeds and materials and for moisture in excess of 10 per cent.

The Co-operative shall operate a separate "pooling account" for the oilseed varieties referred to in this contract.

The Co-operative may increase the rate of initial payment, as stated in paragraph 3, as it may from time to time determine
feasible.

The Co-operative may control the time of deliveries by imposing quotas on deliveries or by otherwise directing when
deliveries shall be made, but on seed delivered after November 15, 1969 the Co-operative will pay the Grower in addition to
the initial price an allowance for on-farm storage at the rate of approximately 4 cents per 100 pounds per month.

The Co-operative shall handle, process and market all such sunflower seed delivered to it at such a time, place, and manner
as it shall in its discretion determine to be in the best interest of all the growers who have signed this and similar contracts.

The Co-operative shall deduct from the moneys received for the sale of all sunflower seed in the oilseed "pooling account"
the appropriate amount of initial payments paid to the growers together with charges for handling, storing, cleaning, pro-
cessing, drying, marketing, and other services and charges to reserve. It shall distribute the remaining sum to the growers
who delivered the seed of the oilseed varieties to the Co-operative pursuant to this contract, and on a basis proportionate
to the amount of seed delivered by each grower.

Any advances made to the Grower by the Co-operative in seed or otherwise shall constitute part payment for the sunflower
seed grown and delivered, and the Grower agrees that the same shall be deducted from the initial or subsequent payments to
him or shall be paid in cash. Interest at the rate of 4% shall be charged on any advances made under this contract.

In witness whereof this agreement has been executed by Co-op. Vegetable Oils Ltd. and by the Grower on

..... day of ....., 1969.

.....
Grower

OP. VEGETABLE OILS LTD.

: ..... Phone .....

C-No. .....

Co-op. Vegetable Oils Ltd.

1970 SUNFLOWER CONTRACT

greement made between Co-op. Vegetable Oils Ltd., a company with head office at Altona, in Manitoba (herein called the

ative) and .....
(Name of Grower)

..... (hereinafter called the Grower).
(Post Office Address)

HEREAS the Co-operative has offered to market on a pooling basis the Grower's sunflower seed production of the variety or s and acreage as specified below, and has agreed to make certain initial payments to the Grower and to provide the other s as set out in this agreement, and the Grower has undertaken that he will deliver to the Co-operative all sunflower seed ed by him in the year 1970 of the below stated variety or varieties and acreage which the Grower estimates as follows:

Type Sunflowers:	ACRES	Striped and Roasting Type Seed:	ACRES
redovik	.....	Commander	.....
asnodarets	.....	Valley	.....
mavirec	.....	Total striped or roasting	.....
Total oilseed	.....		

ve acreage being part of the following lands ....
(Land Description)

herefore this contract witnesseth in consideration of the premises and the mutual covenants and agreements herein contained:

Co-operative agrees to sell to the Grower and the Grower agrees to purchase from the Co-operative, seed of the variety or ieties required at the following rates per pound: Peredovik $0.15, Krasnodarets $0.15, Armavirec $0.15, Commander $0.15, Valley 0. (These prices are for Commercial No. 1 seed, f.o.b. at Altona. In Peredovik, Krasnodarets, Armavirec and Commander, Certi- l seed will be offered on the same basis to the extent of available seed stocks at $0.20 and Registered Foundation seed at $0.30 pound.)

Grower agrees to deliver to the Co-operative for marketing by it all sunflower seed produced by him in the crop year ending y 31, 1971 of the variety or varieties and acreage as stated in the preamble of this contract.

Co-operative agrees to accept delivery of all such sunflower seed at Altona, Manitoba, and to pay to the Grower at the time delivery an initial payment of not less than $3.50 per 100 pounds on basis Grade No. 1 CW sunflower seed, subject to grade count, and subject to dockage for foreign seeds and materials and for moisture in excess of 10 per cent. If moisture is over %, the initial pooling price will be discounted at the rate of 2c per 100 pounds for each percentage point that it is over 13%.

Co-operative shall operate "pooling accounts" with respect to all contract purchases of the following seed types:
) oilseed such as Peredovik, Krasnodarets and Armavirec
) "striped-seed" of Valley
) seed of the large-seeded variety Commander.

Co-operative may increase the rate of intial payment, as stated in paragraph 3, as it may from time to time determine sible.

Co-operative may control the time of deliveries by imposing quotas on deliveries or by otherwise directing when deliveries ll be made, but on seed delivered after November 15, 1970 the Co-operative will pay the Grower in addition to the initial price allowance for on-farm storage at the rate of 4 cents per 100 pounds per month.

Co-operative shall handle, process and market all such sunflower seed delivered to it at such a time, place, and manner as shall in its discretion determine to be in the best interest of all the growers who have signed this and similar contracts.

Co-operative shall deduct from the moneys received for the sale of all sunflower seed and sunflower seed products the propriate amount of initial payments paid to the growers together with charges for handling, storing, cleaning, processing, ing, marketing, and other services and charges to reserve. It shall distribute the remaining sums to the growers who delivered seed to the Co-operative pursuant to this contract, and on a basis proportionate to the amount of seed delivered by each grower.

y advances made to the Grower by the Co-operative in seed or otherwise shall constitute part payment for the sunflower seed wn and delivered, and the Grower agrees that the same shall be deducted from the initial or subsequent payments to him or hall be paid in cash. Interest at the rate of 4% shall be charged on any advances made under this contract.

witness whereof this agreement has been executed by Co-op. Vegetable Oils Ltd. and by the Grower on

..... day of ..... 1970.

VEGETABLE OILS LTD. .....
Grower

..... Phone .....

C-No. .....

APPENDIX B

Summary of data from the co-operative tests of sunflowers at all stations, 1968.

Character	No. Stations Reporting	Armavirec	Peredovik	Krasnodarets	Majak	Valley	CM323 x Peredovik	Lethbridge 57
		A	B	C	D	E	F	G
Days to bloom	4-9	75.6	82.2	75.0	88.0	87.5	82.2	78.4
Days to mature	2-4	125.0	132.6	126.2	136.0	134.2	131.6	124.6
Height (in.)	4-9	50.9	63.8	54.4	64.5	58.7	54.8	49.6
Head diam. (in.)	3-7	4.9	5.8	5.3	6.3	6.1	5.5	5.4
Stem strength (1-5)	4-7	2.7	2.9	2.6	2.9	3.3	3.3	1.9
% Lodging	2-4	11.8	4.4	6.5	11.8	17.4	2.9	16.0
Weight/bus. (lbs.)	6-10	28.6	28.3	28.8	28.2	30.4	29.4	26.1
Weight/M seeds (g.)	6-8	60.8	57.6	59.9	59.2	67.3	51.9	65.8
% Meats	7-10	74.3	76.2	75.7	76.2	66.2	76.6	75.8
% Oil	5-8	43.1	45.7	44.0	44.2	39.2	47.9	43.3
Seed/acre (cwt.)	6-10	10.6	15.9	11.9	14.3	18.2	14.8	11.5
Meats/acre (cwt.)	6-10	7.9	12.1	9.0	10.9	12.0	11.3	8.7
Oil/acre (cwt.)	5-8	4.6	7.3	5.2	6.3	7.1	7.1	5.0

Source: Research Station, Canada Department of Agriculture, Morden.

TABLE IIB

Yield in pounds per acre of the oil type varieties grown at four Manitoba points in 1967 and 1968.

Station	Year	Varieties			
		Peredovik	Valley	Armavirec	Krasnodarets
Morden	1967	2114	3312	1794	1908
	1968	1314	1520	908	942
Portage la Prairie	1967	2378	3116	1880	2262
	1968	1859	2120	968	1258
Altona	1967	1378	1377	827	1243
	1968	1045	1135	1072	966
Brandon	1967	-	-	-	-
	1968	1338	1781	899	1097
Mean		1632	2052	1193	1382
Note - % oil 1967		42.6	38.7	40.4	41.0

Source: Research Station, Canada Department of Agriculture, Morden.