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**MARKET OUTLETS AND  
MARKETING METHODS  
for  
Sunflower Seed and  
Tame Mustard Seed**

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\*           This study was designed to provide useful information for       \*  
\* those engaged in the production, processing, and marketing of       \*  
\* sunflower seed and tame mustard seed.                               \*  
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MARKET OUTLETS AND MARKETING METHODS  
FOR SUNFLOWER SEED AND TAME MUSTARD SEED

LeRoy W. Schaffner and Fred R. Taylor<sup>1</sup>

INTRODUCTION

North Dakota farmers are becoming interested in specialty crops. The cash crop alternatives are limited, and farmers are looking for crops that will maintain or increase their farm income. Sunflower seed and tame mustard seed are two specialty crops drawing increased interest from farmers in North Dakota.

Specialty crops will not replace the present crops grown but may supplement them. A basic point to keep in mind about sunflower seed and tame mustard seed is that these crops are grown for a specialty market, and the type of seed grown is adapted to this specialty market. These crops do not have a ready market where the producer can dispose of his crop at any time. These markets are very sensitive to supply, and the price of the crop reacts inversely to the supply. Many of the specialty crops are grown under contract because it insures the processor of an adequate supply for processing, and the producer is assured of a market for his production.

Sunflower and tame mustard seed can be and are grown in North Dakota. Seventeen thousand acres of sunflower seed<sup>2</sup> and about fifty thousand acres of tame mustard seed<sup>3</sup> were harvested in North Dakota in 1964. Sunflower seed was first reported in the agricultural census of North Dakota in 1939 with 12 farmers growing sunflowers. Tame mustard seed has been grown in North Dakota on a very limited basis for 30 or 35 years. Low yields and marketing problems limited the crop to a trial and experimental basis. Mustard seed was grown in North Dakota on a commercial scale for the first time in 1962 with about 600 farmers planting about 35,000 to 40,000 acres.<sup>4</sup>

Objectives of the Study

The study of the market outlets and marketing methods for sunflower seed and tame mustard seed had three objectives which were:

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<sup>1</sup>Schaffner is assistant professor, and Taylor is professor of Agricultural Economics, Agricultural Experiment Station, North Dakota State University.

<sup>2</sup>Heltemes, C. J., Annual Crop Summary, North Dakota Crop and Livestock Reporting Service, United States Department of Agriculture and Agricultural Experiment Station, North Dakota State University, Fargo, North Dakota, December 1964, p. 2.

<sup>3</sup>Estimated.

<sup>4</sup>Estimated by county extension agents.

1. To determine present and potential acreage, production, utilization, and consumption.
2. To determine present and potential market outlets and marketing methods.
3. To evaluate potentials for processing facilities and marketing problems associated with processing.

Statistical information for these crops is limited because of the small number of firms in the various phases of the industry. Some of the statistics given in this study are the best estimates, made by people closely associated with the industry, of what is taking place.

#### PART I: SUNFLOWER SEED

Sunflower seed production is not new to North Dakota. The Census of Agriculture reported sunflower seed acreage for the first time in 1939. For the United States the Census of Agriculture for 1909 reported 665 farmers growing 4,731 acres. The total acreage grown in the United States has not been large. The Census of Agriculture for 1959 showed a total of 25,705 acres which produced 14,929,464 pounds of sunflower seed. This was the highest acreage ever reported.

The supply of sunflower seed in the United States comes from two sources-- domestic production and imports.

#### Domestic Production

In 1959, the last census year, 17 states reported growing some sunflowers. Four states accounted for 90 per cent of the acreage. North Dakota had the largest acreage accounting for 53 per cent of the total acreage. California, Minnesota, and Missouri were the other large producing states.

The acreage of sunflower seed grown in North Dakota fluctuates from year to year. Thirty thousand acres were harvested in 1963, and in 1962 only 12,500 acres were harvested. It is estimated that about 93 per cent of the sunflower seed production is grown in Ransom, Steele, Richland, Cass, Traill, Grand Forks, and Pembina counties. These counties are located in eastern North Dakota (Figure 1).

Table 1 gives the estimated cost of producing sunflower seed in the Red River Valley area. In comparing these costs and returns with the other cash crops grown in this area, sunflower seed is exceeded only by wheat, potatoes, and sugar beets in returns to land, labor, and management.<sup>5</sup> Barley, flax, oats, and tame

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<sup>5</sup>Sobering, Fred D., and Laurel D. Loftsgard, Crop Costs and Returns, North Dakota Economic Area 4, Circular FM-63-7, Cooperative Extension Service and Agricultural Experiment Station, North Dakota State University, Fargo, North Dakota, March 1963.



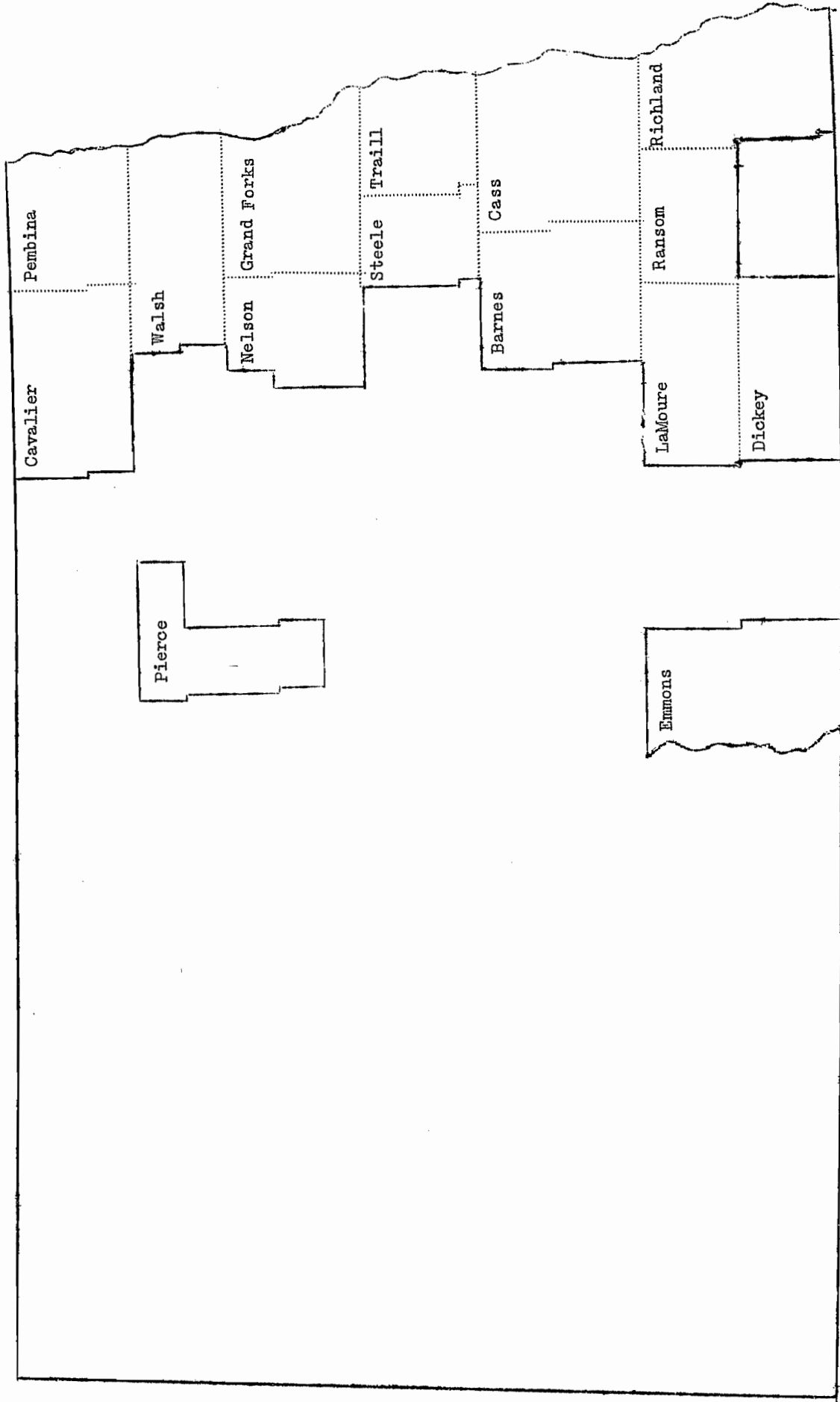


Figure 1. Location of the North Dakota Sunflower Seed Production in 1963

mustard seed were rated by county extension agents as close competitors to sunflower seed. Production costs for sunflower seed are in about the same range as oats and flax, \$14.70 per acre.

The yield per harvested acre in 1962 was 980 pounds, 970 pounds in 1963, and 520 pounds in 1964. Growers who have grown sunflower seed for a period of years hope to average between 1,000 and 1,200 pounds per acre. In 1963 about 68 per cent of the sunflower seed acreage in North Dakota was grown under some form of formal contract or verbal agreement with processing and marketing firms.

TABLE 1. ESTIMATED COSTS AND RETURNS OF PRODUCING SUNFLOWER SEED IN THE RED RIVER VALLEY AREA

Cost Inputs	Dollars Per Acre
<u>Average Management</u>	
Pre-harvest Costs	
Machine ownership <sup>a</sup>	\$ 2.97
Repair, fuel, and oil	3.13
Seed	<u>1.25</u>
Total Pre-harvest Costs	\$ 7.35
Harvest Costs	
Machine ownership <sup>a</sup>	\$ 3.41
Repair, fuel, and oil	1.60
Hired labor	<u>.64</u>
Total Harvest Costs	\$ 5.65
Real Estate Taxes	\$ 1.65
Total Production Costs	\$14.65
Land Charge	\$ 6.50
Total All Costs	\$21.15
Unit Price Per Pound	\$ .0425
Average Yield in Pounds Per Acre	800
Gross Return Per Acre	\$34.00
Operator Return <sup>b</sup>	\$19.35
<u>With Better Management</u>	
Added Costs	
Fertilizer	\$ 2.10
Seed	\$ 1.25
Total production costs	\$18.00
Yield Per Acre in Pounds	1,000
Gross Return Per Acre	\$42.50
Operator Return	\$24.50

<sup>a</sup>Machine ownership cost includes depreciation, interest on investment, taxes, insurance, and housing.

<sup>b</sup>Return to land, operator, and management.

Sunflower seed production fits into the crop rotation, and growers give the following advantages in growing the crop:

1. It is a row crop which permits weed control before and after planting.
2. It has greater frost resistance than corn.
3. It is quite drought resistant except during and shortly after flowering.
4. It aids in the distribution of farm labor, particularly at harvest.
5. It competes with flax and barley in returns per acre.
6. A partial acreage diversion payment has been allowed in some years when planted on the diverted acres.

There are some hazards in growing sunflower seed. The sunflower moth is an insect which can cause damage when it is present. It has been more prevalent in the southern part of the sunflower area than in the northern part. Also, birds can cause severe crop damage in some years. This is particularly true when fields are located near trees or water. Sunflower seed can be subject to soil borne diseases if grown on the same land too often. It is recommended that sunflowers should be grown on the same land only about once in five years. Some areas have had to reduce the acreage or go out of production of sunflower seed because of this problem. Some varieties of sunflower seed are susceptible to field shattering if not harvested at the right time. This field shattering may reduce yields by as much as 25 to 30 per cent.

The higher quality sunflower seed is grown in areas where the nights are cool and dry. Generally, the quality is best in the area from Fargo to the Canadian border and in Canada.

#### Imports

Imports have been the main source of supply for sunflower seed. In 1959 the United States imported about 41 per cent of the sunflower seed used. Table 2 shows the percentage of sunflower seed imported into the United States by country of origin and the total pounds imported for the 10-year period 1954 to 1963. The largest proportion of the imports, 60 to 98 per cent, has been coming from Canada since 1955. The African nations have been the next largest source of imports. The total imports for the 10-year period 1954 to 1963 varied from 809,000 to 20,000,000 pounds. The trend has been to increase the volume of sunflower seed imported. From 1956 to the present there has been a sharp increase in the volume of sunflower seed imported (Table 2).

The large imports of both sunflower seed and tame mustard seed from Canada have the benefit of helping to maintain a balance of trade. The value of the

TABLE 2. SUNFLOWER SEED: PERCENTAGE IMPORTED INTO THE UNITED STATES BY COUNTRY OF ORIGIN AND TOTAL POUNDS IMPORTED, 1954 TO 1963

Country of Origin	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Africa		24.96	.26	1.05	21.28	28.36	21.67	13.67	18.73	38.49
Canada	23.24	60.38	94.77	98.02	66.74	61.15	74.64	84.83	73.68	60.60
Egypt	19.18		.51							
Greece			3.53	.20	2.62	5.35	1.53	1.08	3.31	.70
Hungary	26.97		.49		6.42	4.72	1.80	.42		.21
India					.11					
Iran	30.61				1.02		.20			
Mexico			.40	.73						
Netherlands			.04		.82					
United Kingdom		14.66					.16			
West Germany					.99	.42				
Other Countries									4.28	
Total Imported	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Total Imports in Thousands of Pounds	809	1,540	5,575	6,149	10,011	10,381	8,540	11,767	20,038	15,366

Source: United States Department of Commerce, Bureau of Census, United States Imports of Merchandise for Consumption, Commodity by Country of Origin, FT 110, Annual summary 1954 through 1963.

goods exported to Canada exceeds the value of goods imported. For the 3-year period 1959 to 1961 the value of the imports from Canada was 88 per cent of the value of the goods exported from the United States to Canada. The ratio of imports to exports for agricultural commodities for this same period was about 80 per cent.

The question may arise as to why the United States does not produce more sunflower seed and import less. The Canadian sunflower seed production is found largely in the provinces of Manitoba, Alberta, and Saskatchewan. Canada uses the sunflower seed largely for oil purposes. The Canadian producer can compete favorably with the United States growers because of:

1. Lower cost transportation.
2. Money exchange rate favors the Canadian producer.
3. Cost of production lower than in the United States.
4. Canada is a stable supply area.

The domestic market value is based on the world supply and demand situation. When there is an ample world supply of sunflower seed and oil, the price drops because the exporting countries are satisfied with a lower price to move the crop. During these periods, sunflower seed can often be imported for less than the cost of producing and marketing the domestic crop. In years of small world production the price will go up. Sunflower seed cannot be stored too long without going out of condition. The supply is generally moved before the next crop comes on the market.

The import duty on sunflower seed is .8 cent per pound. If obtained from a Communist country, the duty would be 2.0 cents per pound.

#### Demand

The three primary uses of sunflower seed include bird seed, human food, and oil. Statistics are not available as to the proportion of sunflower seed going to the various outlets. One person, who is acquainted with the sunflower seed industry, estimated that there is a present demand for about 40 to 60 million pounds annually. The bird seed industry is the largest consumer of sunflower seed using about 65 per cent of the supply, 25 per cent goes for human food uses, and about 10 per cent is crushed for oil.

The pet food industry has been expanding with the trend toward suburban living, more leisure time, and higher incomes. About \$1 of every \$100 of the grocery dollars is spent on pet food. There are 730 million "customers" for pet foods when cats, dogs, birds, and fish are included.

Sunflower seed for human consumption is the second important use. Sunflower seed is sold in supermarkets and other outlets as a confection. The seed is used in many forms, two of which are (1) roasted and salted in the shell and (2) the meats of the hulled seed are packaged for the consumer for cooking purposes and may be purchased at most grocery stores. An expanding use is found in

the making of a variety of mixes for candy, and the health food industry uses sunflower seed in many of its products.

The trend has been toward increased use in the confectionary industry. This has come about as a result of much research. There are problems which have been encountered in trying to expand the use of sunflower seed in the confectionary trade. The high oil content of the seed has made it difficult to produce a product that will maintain quality over a period of time, be tasty, and leave no undesirable aftertaste. Research has been able to overcome most of these problems.

Sunflower seed has not been used to any large extent for oil in the United States. The oil from the seed makes a very desirable oil for margarine, salad oil, and cooking oil. It is apparent that sunflower oil would be suitable for making fine hand soaps, which use oil in their manufacture. Sunflower seed oil competes with oils, such as soybean oil, cottonseed oil, corn oil, and safflower oil for a market. At the present time there is a plentiful supply of these other oils.

The United States has experienced relatively minor changes in the per capita consumption of food fats and oils during the last three decades. The annual usage level in 1930 was 45.0 pounds per person, and by 1960 it was 45.5 pounds per person.<sup>6</sup> The increased total consumption is closely related to the increasing population growth. Food fats and oils amounting to 5,545,000,000 pounds were used in 1930, and by 1960 this increased to 8,241,000,000 pounds. The only change in per capita consumption has been some tendency to shift from solid fats to the liquids and from the animal fats to the vegetable fats.

The amount of fats and oils used in nonfood uses has increased since 1930, although there has been some change in the amounts going to the various uses. The amount used in the soap and drying oil industries has been decreasing, while the amount used for other industrial uses has increased. In industry there are many competitive products that can be used. Industry selects the product that will give the quality product which it wants at the least cost.

The vegetable oil market is very competitive, and the supply is adequate to meet all the needs for the present time. The outlook for increased market outlets for sunflower seed oils is not too promising at this time. The varieties of sunflower seed in this area are grown largely for bird food, and the oil content of the seed is low in comparison to the varieties grown principally for oil. Bird feed varieties grown in this area contain about 29 per cent oil. The oil varieties that can be grown in this area contain about 35 per cent oil. The processing of sunflower seed for oil would not be economically feasible at this time because:

1. The sunflower seed varieties now grown in North Dakota have a low oil content. Varieties could be changed quickly if there were a demand for the oil.

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<sup>6</sup>Kromer, G. W., "Food Fat Consumption High in 1961," Fats and Oil Situation, Economic Research Service, United States Department of Agriculture, Washington, D. C., March 1962, p. 23.

2. The principal income from sunflower seed processing would have to come from the oil. Soybeans, a competing oil crop, is a crop for which the meal contributes more to the income than the oil. Although sunflower seed processing would have meal as a by-product, it would be difficult to break into the meal market with a new product and command the same price. Sunflower seed meal would have to be fed in limited amounts because of the character of the oil remaining in the meal, as it tends to produce soft pork or butter.
3. Development of new varieties and cultural practices of competing oil crops has changed the geography of oil availability as well as increased the total supply of vegetable oils in the market.
4. The trend in the oil processing industry has been toward fewer but larger plants requiring a higher capital investment than in the past.
5. Sunflower seed processing would have a higher risk from the standpoint of price of the raw material and the end products. In soybean processing the processor can be protected to a degree on price fluctuations by hedging. Soybeans, soybean oil, and soybean meal can all be traded on the futures market. In sunflower seed processing none of the products can be hedged except in the form of grower-processor contracts.

Any expansion in the processing of sunflower seed for oil will probably come from plants processing oil from the other crops to lengthen the processing season with sunflower seed if the raw material were readily available.

#### Present Marketing Channels

A survey of county extension agents indicated that there were about eight different buyers of sunflower seed in North Dakota in 1963. About two thirds of the companies are located outside the state. These companies generally have a representative come in and contract for an acreage in an area and make arrangements with a country elevator to assemble the seed when it is harvested and ship it to the processing point. Some companies work through a local group or business to obtain the acreage desired. They also use a local elevator as a point of concentration for the seed when it is harvested. The sunflower seed is usually cleaned before it is moved out of the country elevator.

There are three points located in North Dakota where sunflower seed is processed into the final product, bird food. The bird food that is packaged in North Dakota is for companies located outside the state. These companies furnish empty cartons and bags which carry their label for filling. One handler of sunflower seed in North Dakota is doing some research to develop new products and markets for sunflower seed. This handler has one of the most complete sunflower

processing plants in the nation. Most of the sunflower seed and the finished products from the seed go to markets located in the North Central and Eastern states.

Most of the companies prefer and do use grower contracts. This insures the company a stable supply of seed to meet their requirements. The contract guarantees the grower a market providing the crop is not of such poor quality that it is not fit for the market. There is often a minimum payment that will partially cover production costs. The contracts vary with each company on how the payment is made. For example, some contracts guarantee the producer a specific price that will be paid. These payments may be made in various ways. Some contracts allow for about four payments during the season, and some may pay a higher rate for the first specified number of pounds and a lower rate for the remainder. Many times the producer is required to store the crop on the farm until the company calls for it.

Any producer growing sunflower seed without first making arrangements for the marketing of the crop runs the risk of not finding a market outlet; and, if there is a good crop, he may have to sell at a lower price to move the crop before the quality deteriorates. Price is limited by the pressure of imports and the freight costs to the heavy consuming areas. Specialty crops cannot be marketed at any elevator like grain. This is why it is important to check into the marketing of the crop in advance of planting.

#### Summary

Sunflower seed acreage may expand in the next few years. This expansion in acreage may result from an increase in consumption and domestic production replacing some of the imports. To be able to compete with imports, North Dakota producers of sunflower seed have to be efficient and become a stable source of supply for buyers. Any reduction in transportation costs to the markets will help make North Dakota become more competitive.

The bird food industry is the major consumer of sunflower seed. There may be opportunities for some expansion of plants in this area to package bird food. North Dakota produces many of the other grains that go into mixed bird seed. Much of the sunflower seed, millet, canary grass seed, etc., that is grown in North Dakota is shipped to other areas for processing and packaging into bird food. The big investment in a bird food processing plant would be in building facilities to store the grain products used. Some plants have a storage capacity of 100,000 bushels or more. The labor requirements for these plants are small as most operations are mechanized. The main disadvantage for North Dakota is the distance to consumer markets. The main markets are located to the east. One processor, however, indicated that transportation costs can be reduced by packaging the bird food close to the supply of raw material.

The outlook is not bright for expanding the processing of products other than bird food from sunflower seed. The varieties grown in North Dakota are produced for the bird food market and are low in oil content. Oil varieties can be grown in this area if there should be a demand for the oil. At the present time there is a very limited demand for it. The oil can be extracted from the seed by the same process used for the other oilseed crops.



The development of new products and markets for sunflower seed has been slow. The investment in equipment to handle and process sunflower seed is high. Sunflower seed has to be handled and stored under proper conditions or the seed will go out of condition. The seed can be stored all winter without too much difficulty if the moisture level in the seed is not above 12 per cent. In warm weather the oil tends to soak into the hull and lower the quality of the seed.

The following items summarize the sunflower seed production and marketing situation:

1. Production

- a. Row crop.
- b. Low margin of operation as in small grains.
- c. Requires special attachment to combine for harvesting.
- d. Generally grown under some form of formal contract or verbal agreement with processing and marketing firms.

2. Marketing

- a. Limited market.
- b. Market very sensitive to supply causing extreme price fluctuations.
- c. Competition from foreign imports.
- d. Bird food market largest consumer.

3. Bird Food Industry

- a. High capital investment.
- b. Requires large inventories and storage capacity.
- c. Generally integrated with other operations.
- d. High quality product required to meet competition.
- e. Requires a stable supply of raw materials year after year.

4. New Market Outlets

- a. No new or different products which use sunflower seed appear on the horizon at this time.
- b. Major emphasis is being placed on expanding the markets for food items such as candy and other confections.
- c. The research process for new uses and outlets is slow and requires large expenditures of capital, with research being carried on by private firms.

## PART II: TAME MUSTARD SEED

The history of mustard seed goes back a long way. It is recorded that seeds of the mustard plant were employed by the ancient Cretan, Egyptian, and Roman civilizations for preserving, flavoring, and medicinal purposes. The Romans introduced the mustard plant into Britain. The principal countries producing mustard commercially are the United States, Canada, the United Kingdom, Argentina, Chile, Denmark, Italy, The Netherlands, China, Japan, Ethiopia, Mexico, Poland, Sweden, Turkey, India, and West Germany.

The mustard seed production areas in the United States are California, Montana, Washington, Oregon, North Dakota, and Minnesota. North Dakota and Minnesota started producing mustard seed on a commercial basis in 1962. In 1962 about 600 farmers grew 35,000 to 40,000 acres of mustard. In 1963 about 1,200 farmers grew about 70,000 acres.<sup>1</sup> A large yield was obtained in 1963 resulting in overproduction, and acreage dropped to about 50,000 acres in 1964. The main mustard seed production area in North Dakota is located in the northern tier of counties from Ward to Pembina. In 1965 the production area was extended to counties in southeastern North Dakota.

### Domestic Production

Prior to 1962 the domestic supply of tame mustard seed had been grown largely in two states, Montana and California. In the 5-year period 1958 to 1962 Montana produced 96.5 per cent of the tame mustard seed. In 1962 contractors of mustard seed moved into North Dakota and Minnesota. The area in North Dakota where tame mustard seed was produced in 1962 is shown in Figure 2. This area consisted of 23 counties. The largest concentration of acreage was in the northeastern counties in 1963 and 1964. The production area in North Dakota has not been stabilized. In 1965 other counties in southeastern North Dakota are being sought by a mustard seed contracting company. It is not known at this time the acreage that is being contracted for mustard seed production. The 1961 drought in Montana prompted the contractors to move eastward to find a more stable production area. Table 3 shows the United States production of clean seed for the 5-year period 1958 to 1962. The proportion grown in North Dakota in 1962 was not reported in the United States Department of Agriculture production figures. The proportion produced in North Dakota is estimated to be over 16,000,000 pounds, which is greater than the total United States production shown for 1962 in Table 3. The domestic production for the period 1958 to 1962 ranged from 16,000,000 pounds to about 27,000,000 pounds if the 1962 figure was adjusted for the North Dakota and Minnesota production.

The cultural procedure for mustard seed is more similar to flax, sweet clover, and alfalfa--the seeds are small and cannot be seeded very deeply, and the soil should be level and firm. No additional equipment is required. The mustard plant grows best in areas where there are low or moderate temperatures, high humidity, and moist soil.

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<sup>1</sup>Estimated by county extension agents.

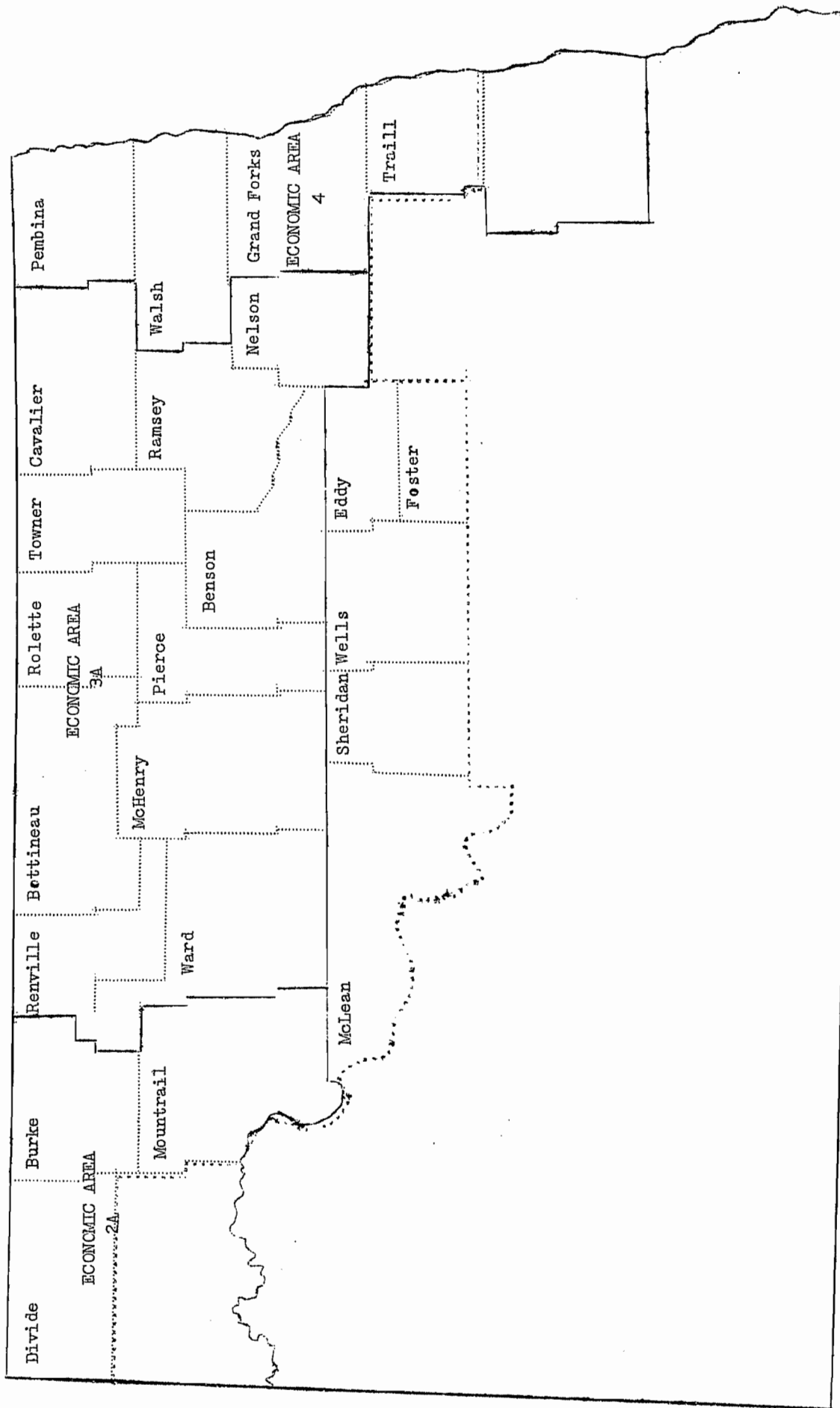


Figure 2. Tame Mustard Seed Production Area in 1962 and Location of North Dakota Census Economic Areas 2A, 3A, and 4

TABLE 3. MUSTARD SEED: PRODUCTION OF CLEAN SEED BY STATES, 1958 TO 1962

State	1958	1959	1960	1961	1962 <sup>a</sup>
	thousand pounds				
Montana	19,298	18,528	22,414	16,020	10,540
California	260	750	1,822	48	234
Total	19,558	19,278	24,236	16,068	10,774

<sup>a</sup>Preliminary

Source: United States Department of Agriculture, Agricultural Statistics, 1963, Washington, D. C., p. 281.

In 1962 a survey of 148 growers showed they obtained an average yield of 677 pounds to the acre.<sup>2</sup> About 29 per cent of the growers reporting in the survey put mustard on summerfallow. Since mustard is not a good weed fighter, the most satisfactory results can be obtained by planting on clean land. The growers encountered some production and harvesting problems which can be expected when a new crop is introduced in an area. Some of the problems included:

1. Weeds.
2. Proper seeding date.
3. Heavy rains after seeding causing poor emergence due to soil becoming crusted.
4. Proper time to harvest to prevent shattering.
5. Winds blowing swaths around.
6. Hard to get drill set for the proper seeding rate. Good results were obtained when grass seed attachment was used.

Most of these problems are of a nature that can be solved with advice from the technicians and by more experience in growing mustard.

In 1963 the largest increase in acreage in North Dakota was in the north-eastern counties. Pembina County alone had about 20,000 acres.

Table 4 shows the estimated costs and returns for tame mustard seed grown on summerfallow and land following a crop in census economic areas 2A, 3A, and 4. The location of the census economic areas is shown in Figure 2. In census economic areas 2A and 3A mustard ranks next to wheat in returns to land, labor, and capital.<sup>3</sup> In census economic area 4 mustard falls into about the same range as

<sup>2</sup>Jensen, L. A., Tame Mustard Crop Summary, 1962, Extension Agronomist, North Dakota State University, Fargo, North Dakota, December 1962, mimeographed.

<sup>3</sup>Sobering, Fred D., and Laurel D. Loftsgard, Crop Costs and Returns, North Dakota Economic Areas 2A, 3A, and 4, Circulars FM-63-2, FM-63-4, and FM-63-7, Cooperative Extension Service and Agricultural Experiment Station, North Dakota State University, Fargo, North Dakota, March 1963.

TABLE 4. ESTIMATED COSTS AND RETURNS FOR TAME MUSTARD SEED GROWN ON FALLOW AND NONFALLOW LAND IN ECONOMIC AREAS 2A, 3A, and 4

Cost Inputs	Economic Area 2A		Economic Area 3A		Economic Area 4	
	Fallow <sup>c</sup>	Nonfallow	Fallow <sup>d</sup>	Nonfallow	Fallow <sup>e</sup>	Nonfallow
<b>Pre-harvest Costs</b>						
Machine ownership <sup>a</sup>	\$ 2.10	\$ 1.45	\$ 2.85	\$ 1.65	\$ 3.35	\$ 2.20
Repair, fuel, and oil	2.00	1.10	2.90	1.30	3.60	2.00
Seed (10 lbs. x 10 cents)	1.00	1.00	1.00	1.00	1.00	1.00
Spray (insects)	.45	.45	.45	.45	.45	.45
Total Pre-harvest Cost	\$ 5.55	\$ 4.00	\$ 7.20	\$ 4.40	\$ 8.40	\$ 5.65
<b>Harvest Costs</b>						
Machine ownership <sup>a</sup>	\$ 2.65	\$ 2.40	\$ 2.65	\$ 2.40	\$ 3.20	\$ 2.80
Repair, fuel, and oil	1.30	1.15	1.40	1.25	1.65	1.35
Hired labor	.65	.45	.75	.55	.95	.65
Total Harvest Cost	\$ 4.60	\$ 4.00	\$ 4.80	\$ 4.20	\$ 5.80	\$ 4.80
Real estate taxes	\$ 2.00	\$ 1.00	\$ 2.40	\$ 1.20	\$ 3.30	\$ 1.65
Total Production Cost	\$12.15	\$ 9.00	\$14.40	\$ 9.80	\$17.50	\$12.10
Land charge	\$ 5.00	\$ 2.50	\$ 6.00	\$ 3.00	\$13.00	\$ 6.50
Total All Costs	\$17.15	\$11.50	\$20.40	\$12.80	\$30.50	\$18.60
Unit Price Per Pound	\$ .05	\$ .05	\$ .05	\$ .05	\$ .05	\$ .05
Average Yield in Pounds	500	350	575	425	750	500
Gross Return Per Acre	\$25.00	\$17.50	\$28.75	\$21.25	\$37.50	\$25.00
Operator Return <sup>b</sup>	\$12.85	\$ 8.50	\$14.35	\$11.45	\$20.00	\$12.90

<sup>a</sup>Machine ownership includes depreciation, interest on investment, personal property tax, insurance, and housing.

<sup>b</sup>Return to land, labor, and management.

<sup>c</sup>Includes fallow costs of: machine ownership \$0.95; repair, fuel, and oil \$1.05; real estate tax \$1.00; and land charge \$2.50 per acre.

<sup>d</sup>Includes fallow costs of: machine ownership \$1.40; repair, fuel, and oil \$1.70; real estate tax \$1.20; and land charge \$3.00 per acre.

<sup>e</sup>Includes fallow costs of: machine ownership \$2.00; repair, fuel, and oil \$2.50; real estate tax \$1.65; and land charge \$6.50 per acre.

TABLE 5. WHOLE MUSTARD SEED: PER CENT OF TOTAL IMPORTS TO THE UNITED STATES BY COUNTRY OF ORIGIN AND TOTAL POUNDS IMPORTED, 1954 TO 1963

Country of Origin	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
	per cent									
Canada	88.14	86.44	92.71	89.64	82.48	87.18	76.52	33.37	39.97	61.37
Chile	.31	.42	.02							
Denmark	4.28	5.74	4.07	6.54	7.17	9.72	22.17	54.97	50.42	34.48
Ethiopia				.47	6.56	.70	.65	.56		1.56
France						.01		4.13	1.13	.25
Italy	2.53	1.50	1.26	.98	1.96	.35	.19	.84	.45	.98
Mexico	.02									
Netherlands	1.79	2.32	.72	.73	.39	.78	.03	.96		
Poland								.54	.90	
Sweden		.16				.11				
Turkey	.05	.03								
United Kingdom	2.88	3.39	1.21	1.64	1.44	1.15	.44	3.48	1.26	.66
West Germany			.01					1.15		
Other Countries									5.87	.70
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Total Imports in Thousands of Pounds	28,812	34,059	52,231	23,606	18,228	24,137	28,414	42,219	24,083	28,681

Source: United States Department of Commerce, Bureau of Census, United States Imports of Merchandise for Consumption, Commodity by Country of Origin, FT 110, Annual summary for the years 1954 through 1963.

sunflower seed in returns to land, labor, and capital. Mustard should be grown on weed free land, which is the reason for giving the costs and returns figures for both fallow and nonfallow land. In 1962 forty of 135 farmers in the sample planted tame mustard on fallow land.

### Imports

Imports have been the main source of supply for tame mustard seed. In the 10-year period 1954 to 1963 domestic production has ranged from 24 to 51 per cent of the total supply. The major countries exporting mustard seed to the United States are Canada and Denmark (Table 5). Sixty-one per cent of the imports came from Canada and 34 per cent from Denmark in 1963. This proportion varies from year to year (Table 5).

There is also some mustard seed exported from the United States. Mustard seed has been exported to Canada, West Germany, Union of South Africa, Italy, and Venezuela. The amount exported to Canada is probably made up largely of the production that the Canadian mustard seed firms contract for in the United States. Table 6 shows the exports of mustard seed by country of destination. The total amount exported has ranged from .3 to 1.7 million pounds during the 5-year period 1958 to 1962.

TABLE 6. MUSTARD SEED: EXPORTS IN POUNDS FROM THE UNITED STATES BY COUNTRY OF DESTINATION, 1958 TO 1962

Country of Destination	1958	1959	1960	1961	1962
	pounds				
Canada	48,000	1,255,000		389,200	432,209
France	110,068	218,000			
Guatemala		4,000			
Hong Kong			4,400		
Italy	43,670				
Japan			1,053,131		
Mexico	47,640	6,800		82,472	
Netherlands	32,769	135,574			
Philippines				16,927	
Union of South Africa				36,545	
Venezuela		6,420	10,000	9,527	10,800
West Germany	71,645	115,055	68,383		542,434
<b>Total Exports</b>	<b>353,792</b>	<b>1,740,849</b>	<b>1,135,914</b>	<b>534,671</b>	<b>1,022,716</b>

Source: United States Department of Commerce, Bureau of Census, United States Exports of Domestic and Foreign Merchandise, Commodity by Country of Destination, FT 410, Annual summaries for 1958, 1959, 1960, 1961, and 1962.

### Demand

The major use of the mustard seed grown in this area is for table mustard. Mustard seed is also used for flavorings and medicinal purposes. There are no statistics available as to the consumption by the various uses. A rough estimate of the domestic consumption would be about 48,000,000 pounds.

Tame mustard seed is a specialty crop with a limited market. The demand for mustard seed has been increasing in the United States. This increase in demand is credited to a large extent to the increasing number of hamburger and hot dog stands and to outdoor barbecuing throughout the country. The consumption of mustard seed as a condiment is expected to increase about proportional to the increase in population.

One new use for mustard seed that is in the process of development is for a finely ground mustard flour for use in certain sausage products. This might develop into a considerable tonnage in the next few years.

The United States Department of Agriculture, at its Utilization Research Station at Peoria, Illinois, has developed a method to process mustard seed which makes the mustard seed meal suitable for livestock feeding.<sup>4</sup> In addition to the protein supplement, this process also yields a bland oil which might have a potential for industrial uses and a pungent liquid, allyl isothiocyanate, which gives mustard its characteristic taste and odor. Oilseed processes now in use leave this pungent liquid in the meal, making it unsuitable for livestock. This processing study may also lead to the development of a domestic source of erucic acid, which is used in industry. Commercial erucic acid, which is used in rubber manufacture, is now supplied from rapeseed, which is imported.

Tame mustard seed is grown in the United States for use as a condiment. Work on the yield potential of mustard in the Midwestern United States and its marketing possibilities as a processed oilseed has shown that large-scale commercialization will depend upon new end uses for the oil.<sup>5</sup>

### Present Marketing Channels

All of the mustard seed grown in North Dakota is grown under contract. There are two companies which contract for acreage in North Dakota. The contract used in North Dakota generally covers the following items:

1. The minimum acreage that each producer will grow.
2. The contracting firm will furnish seed at a specified price.

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<sup>4</sup>Mustakas, G. C., L. D. Kirk, and E. L. Griffin, Jr., "Mustard Seed Processing: Bland Protein Meal, Bland Oil, and Allyl Isothiocyanate As a By-product," The Journal of the American Oil Chemists Society, 39:8, pp. 372-377.

<sup>5</sup>United States Department of Agriculture, Agricultural Research Service, Crops Research, Crambe, A Potential New Crop for Industrial and Feed Uses, ARS 34-42, September 1962, p. 4.



3. The price that will be paid for the production which must meet specified standards.
4. The point where the producer will deliver the seed grown.

One of the companies, which contracts for the largest acreage in North Dakota, had three points for concentrating the production in 1963. These points were located at Minot, Devils Lake, and Voss. Only the initial step in processing is performed at the concentration point. The mustard seed is cleaned and separated into various lots based on seed quality.

The companies which contract for the production of mustard seed act as a marketing agent for mustard seed. They arrange for a market with the various firms processing mustard seed and with export companies. They generally ship the mustard seed to these market outlets in amounts and at the time specified by the processors. Because of this the producer must be able to store his production on the farm until it is called in by the contracting company.

Most of the large users of mustard seed contract most of their requirements in advance of planting at a fixed price. The price of free seed, seed not grown under contract, fluctuates in accord with supply and demand.

The mustard seed grown in North Dakota is bought in accordance with Montana or the Canadian commercial grades established for mustard seed. The Montana commercial grades for mustard seed were authorized in 1950 by the Grain Standards and Marketing Laws of Montana. The law provides standard requirements which cover four grades. Each grade specifies the percentage of tame mustard seed, heat and other damage, other classes of tame and wild mustard, foreign matter including weeds, and weight per bushel for the tame yellow, oriental, and brown seed types. The Montana and Canadian commercial grades for mustard seed, after removal of dockage, are very similar. Samples from each North Dakota producer are sent to Montana or Canada to establish the grade which is the basis for paying each producer.

#### Summary

The experience of farmers in growing mustard seed during the last three years has been varied. A survey taken in 1962 after the first year of growing mustard showed that 80 per cent of the growers sampled would grow mustard again. Eighty-nine per cent of the growers sampled thought mustard had a place in the farm cropping system in their areas.

Figure 2 showed the production area in 1962 for tame mustard seed to be the northern part of the state east of the Missouri River. In 1965 the area is being expanded to counties in southeastern North Dakota. The mustard seed production area within the state has not as yet been established. The contracting companies look for an area where a large enough acreage can be obtained near the point of concentration and for an area of stable production where there is less risk from the standpoint of moisture during the growing season.

Statistics are not given for the total acres of tame mustard seed grown in the United States. In Montana, the main producing state, planted acreage has ranged from 14,000 to 99,000 acres during the 16-year period 1946 to 1961. The

average harvested yield during this same period for yellow mustard has ranged from 210 to 740 pounds per acre. The 16-year average for yellow mustard was 446 pounds per acre. The average yield of 148 growers in North Dakota in 1962 was 677 pounds per acre. This is a very favorable yield for the first year of production.

Mustard seed is a cash crop which in some areas of North Dakota will give a better net return than barley or flax. Mustard seed is produced in an area of the state where cash crops are limited, and most of the crops now grown are restricted in acreage. In 1964 mustard seed could be planted on diverted acres, and the farmer was permitted to receive 30 per cent of the minimum acreage diversion payment.

One processor of table mustard made the following comment when asked about the possibilities of North Dakota becoming an area of mustard seed production:

We believe that the quality of most of the tame mustard seed produced in North Dakota has met the requirements of the various segments of the industry. Consumers' needs tend to vary according to their end uses. Our firm, perhaps the largest consumer of yellow mustard seed, uses most of its yellow seed for a prepared mustard, and we pride ourselves on the good color of the product and its freedom from specks. Specks, in turn, are related to the presence of certain and very objectionable weed seeds. Wild mustard (charlock) and chenopodium (pig weed) are the two more common troublesome weed seeds in that they impart visible black specks to prepared mustard if present in anything larger than trace quantities. While some objectionable weed seeds can be removed in the cleaning operation, the most effective control is to plant weed free seed on weed free land. This, in turn, generally relates to the use of better land and the better growers who employ better farming practices. It is sometimes difficult to convince growers that mustard requires good weed free land to obtain a good quality crop. North Dakota growers have had less experience with mustard than the growers in the traditional Montana-Alberta areas. We would guess that in time by a process of elimination those who grow the best seed and thereby receive the greater returns will continue to grow mustard. We can see no reason why North Dakota should not be able to produce a crop equal in quality to that produced farther west.

The mustard seed acreage in North Dakota has been as high as 70,000 acres in 1963, and in 1964 about 50,000 acres were planted. There would be room for further expansion if producers could produce a high quality product free of weeds. Part of the acreage expansion would have to come from replacing part of the imports. A processor mentioned that probably most United States consumers would prefer to use the domestic seed as compared to the imported. Table 7 shows that on the average the Canadian producers received higher yields and a lower price per pound than did the Montana growers. The average per acre yield was higher in Canada than in Montana by about 154 pounds for the period shown in Table 7.

There are no studies on the cost of producing mustard seed. If one can make some assumptions from the costs of producing sunflower seed and apply it to mustard seed, one can assume that Canada would have a lower cost of production than North Dakota. From the cost of production standpoint, the big advantage for Canada comes

from cheaper land costs. Canada's other advantage, if the average yield figures in Table 7 are comparable, would be higher average per acre yields. Other advantages that Canada may have would be cheaper transportation costs, particularly where the market is located in an area where the major part of the haul would be by Canadian railroads. The money exchange rate would also be in favor of the Canadian producer. The United States producer has one big advantage. The import duty on tame mustard seed is 1.5 cents per pound. A Canadian grower averaging 638 pounds to the acre would have an import duty of \$9.57 per acre if it were all exported to the United States.

TABLE 7. MUSTARD SEED, ALL VARIETIES: YIELD PER ACRE AND PRICE PER POUND FOR MONTANA AND CANADA, 1953 TO 1960

Crop Year	Montana <sup>a</sup>		Canada <sup>b</sup>	
	Yield Per Acre in Pounds	Price Per Pound	Yield Per Acre in Pounds	Price Per Pound
1953	482	\$.0577	446	\$.050
1954	396	.0523	390	.044
1955	678	.0460	633	.045
1956	694	.0437	969	.038
1957	394	.0484	772	.035
1958	588	.0477	805	.035
1959	386	.0499	613	.038
1960	257	.0495	479	.038
Average	484	.0494	638	.040

<sup>a</sup>Montana Agriculture Statistics, Montana Department of Agriculture cooperating with the United States Department of Agriculture, Statistical Reporting Service, Helena, Montana, December 1956, 1958, 1959, and 1962.

<sup>b</sup>Hill, William H., "Canada's Hot Crop--Mustard," Agricultural Institute Review, November 1961.

North Dakota farmers can best meet competition from imports by:

1. Increasing per acre yields.
2. Producing high quality weed free seed. Both the increased yield and high quality seed factors can best be accomplished by seeding the crop on good land that is weed free and by planting good clean seed.
3. Be willing to maintain the required amount of acreage each year so buyers will look in this direction for a stable supply to meet their requirements.

The processing of mustard seed for other end uses such as oil for industrial uses is still in the research stage. Mustard seed oil would have to compete with crops like rapeseed and a new crop, Crambe. Prospects of processing mustard seed for uses other than the initial process of cleaning and grading the seed are not too bright from the standpoint of markets.

North Dakota has been a producer of tame mustard seed since 1962. Mustard seed is used as a supplemental cash crop to the other cash crops presently grown. The tame mustard seed production area in North Dakota is principally found in the northern tier of counties. There are few cash crop alternatives in this area.

The following items summarize the tame mustard seed production and marketing situation:

1. Production

- a. Domestic production located in northern North Dakota, northwestern Minnesota, Montana, California, Oregon, and Washington.
- b. Low margin of operation similar to small grains.
- c. Grown under contract with marketing and processing firms.
- d. Must be grown on land free of weeds.
- e. Provides an additional cash crop in an area of North Dakota where the cash crop alternatives are limited.

2. Marketing

- a. Limited market.
- b. North Dakota's production used primarily for table mustard.
- c. Competition from foreign imports.
- d. Processing generally integrated with other operations.
- e. Market demands high quality seed that is free of weeds.
- f. Few firms in the industry.

3. New Market Outlets

- a. A new process which is being developed will produce a finely ground flour for use in certain sausage products.
- b. A new process was developed which provides three end products--mustard seed meal which is suitable for livestock feeding, a bland oil which might have a potential for industrial uses, and allyl isothiocyanate, which is a pungent liquid that gives mustard its characteristic taste and odor. The process was developed in the laboratory and has not been used commercially. Markets would need to be established for the end products.