GUIDELINES

for the

PRODUCTION OF RAPESEED

in the

DELTA-CLEARWATER AREA

of

ALASKA

Agricultural Experiment Station
University of Alaska
Fairbanks, Alaska 99701

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* Experience with the production of rapeseed in Alaska is limited. The material presented in this report is for preliminary planning only. It was prepared on the basis of published Canadian research, and studies of variety trials and planting dates during 1977 in interior Alaska. These guidelines will be revised when the results of additional research and experience with rapeseed production in Alaska becomes available.

INTRODUCTION

The word "rape" in rapeseed comes from the Latin word "rapum" meaning turnip. The Brassica napus L. species of rapeseed is an Argentine variety, whereas B. campestris L. is a Polish or turnip variety. Canada is the largest world producer of rapeseed; 1.96 million tons were harvested in 1977. The provinces of Manitoba, Saskatchewan and Alberta are the major production areas. Low erucic acid varieties accounted for 99% of the production. Japan is the largest importer of rapeseed. However, India and Bangladesh are also considered major markets.

The rapeseed plant is bred for its seed. Oil extracted from rapeseed was used for illumination in ancient Asian civilizations, and today is used for edible oil, lubricants, and plastics. Edible oil extracted from rapeseed should be low in erucic acid. In 1973, the Canadian government limited the content of erucic acid in food products to 5%. On the other hand, rapeseed oil with high erucic acid content (greater than 50%) is desirable for many industrial purposes. Research is continuing to lower the glucosinolate content of rapeseed meal which improves its acceptability as an animal feed. Research efforts are also being directed toward lowering the fiber content of the meal. Varieties with low erucic acid and glucosinolate content are referred to as "double-zero" varieties. Those with low fiber as well are referred to as "triple-zero" varieties.

Rapeseed is a cool-season crop which is well adapted to northern agricultural areas. It can be produced in regions with short growing seasons, tolerates frost in the seedling stage, can tolerate warm temperatures (80 - 90°F) during and after flowering, and is long-day in photoperiodic response. Successful production requires either annual precipitation of 15 to 18 inches or a crop-fallow rotation. Rapeseed does well on a wide range of soils. Loamy soils are preferred, but coarse textured soils or peaty soils will produce a good crop if moisture and fertility are adequate. Rapeseed is tolerant of acid soils, although a soil pH less than 5.0 can reduce yields as much as 30%. In addition, the crop has a high salt tolerance (8-15 mmhos/cm).

Rapeseed appears to be an excellent crop for production in interior Alaska. In 1977, it was grown successfully in variety trials and date-of-planting studies at test sites in Fairbanks and Delta Junction. Yields were good and early varieties reached full maturity even when planted as late as June 3. During 1978, approximately 350 acres of low erucic acid rapeseed will be grown in the Delta-Clearwater area.

As a potential crop for interior Alaska, rapeseed would provide:

1. A complementary crop for small-grain producers in a fallow rotation.

2. An export crop of raw rapeseed to Asian markets.

3. A possible new industry with an oil extraction plant if sufficient acreage comes into production.

4. Livestock feed using the rapeseed meal by-product as a high protein supplement.

CLIMATE

The climate of the Delta-Clearwater area in interior Alaska is similar to the climate of the Mackenzie Plain of northern Alberta and the Northwest Territories. Rapeseed is a major crop in these areas. Ft. Simpson (61.5°N latitude), central to the region, has the following climatic characteristics:

Mean Temperature	May - September	57.7°F
	June - August	60.5°F
Degree Days	May - September	1,817 above 42°F
	June - August	931 above 50°F
Frost-Free Days	May 18 - last killing frost	90 days
	September 13 - first killing frost	
Precipitation	Total	13.3 inches
	Snowfall	53.1 inches of snow
Bright Sunshine	June - August	8.9 hours daily
Mean Wind Velocity	May - September	5.0 mph

July is generally the warmest month at Ft. Simpson with a recorded high of 95°F on July 8, 1953. The three peak periods for rainfall are June, late July and late August. The highest winds occur in May and reach a low in August.

The Delta-Clearwater area of Alaska is farther north than Ft. Simpson, and has more hours of bright sunshine. The singular, most noticeable difference between the areas, however, is the wind velocity. High winds can be expected in the Delta-Clearwater area in May, late August and early September. Weather stations in the area have recorded wind velocities of 30-50 mph during these periods.

VARIETIES

Two species of rapeseed are grown as oilseed crops; B. campestris (Polish or turnip) and B. napus (Argentine). Argentine varieties have a higher yield potential and are more disease resistant. Polish varieties mature earlier and may involve less risk when grown in areas with short growing seasons. New varieties of Argentine rapeseed with shorter growing season requirements are being developed. Characteristics of the two rapeseed species are shown in Table 1.

Table 2 shows rapeseed varieties, erucic acid and glucosinolate contents, and license dates. Candle is new and at the present time is the only "double-zero" Polish variety. Tower and Torch make up the majority of the Canadian production. There appears to be no satisfactory market for rapeseed with erucic acid levels in the range 5-40%. Those varieties with erucic acid in this range are no longer recommended in Canada.

During 1977, ten varieties of rapeseed were grown by the Alaska Agricultural Experiment Station in variety trials and two varieties were grown in date-of-planting studies. The studies were located in Fairbanks and Delta Junction, Alaska. Tables 3 and 4 show preliminary data from these studies. Laboratory analyses of erucic acid and glucosinolates are not yet completed. Neither Candle, Regent nor Eltex were included in the 1977 trials but will be included in 1978. The recommended varieties for the 1978 season are Torch and Tower. Tower should be considered a higher risk crop because of its requirement for a longer growing season.

QUALITY

The quality characteristics of importance in rapeseed are oil content of the seed, erucic acid, and meal protein. Meal protein is important in all varieties. However, the meal of low glucosinolate varieties is of greater value because it doesn't have to be blended with low glucosinolate sources of protein. The Canadian mean values for 1977 were:

Oil Content	41.9% (@ 8.5% moisture)
Erucic Acid	1.6%
Meal Protein Content	36.4% (moisture free)

To maintain quality, it is important that rapeseed be well matured, sound, sweet and dry. If oil is refined from good seed, losses should not exceed 8%. On the other hand, 21% losses are not uncommon for poor seed. Canadian rapeseed is given one of three grades, as seen in Table 5.

TABLE 1: CHARACTERISTICS OF ARGENTINE AND POLISH RAPESEED.

Characteristic	Argentine type (*B. napus*)	Turnip rape (*B. campestris*)
Days to mature	About the same as wheat	Two to three weeks earlier than wheat.
Height	2 1/2 to 4 feet	1 1/2 to 3 feet
Shattering	Shatters readily when ripe	More resistant to shattering
Frost damage	Susceptible to late-spring and early-fall frosts	More resistant to early-spring frost and usually matures before fall frosts
Tolerance to drought	Susceptible in late summer	Often matures early enough to escape drought
Seed yield	High under moist, frost-free conditions	Equal to or better than Argentine under frost or drought; otherwise about 15 to 20% less
Seed size and color	Large, very dark brown to black when mature	Small (half as large as Argentine). Reddish brown to black when mature
Oil content	40 to 45%	40 to 44%
Pollination	About 70% self-pollinated	Almost completely cross-pollinated
Staghead disease	Resistant	Susceptible

SOURCE: Rapeseed, Canada's Cinderella crop. Rapeseed Association of Canada, Rpt. 33, 3rd Edition.

TABLE 2: RAPESEED VARIETIES AND CLASSIFICATIONS

Variety	Licensed	Erucic Acid	Glucosinolates
Low Erucic, Low Glucosinolate			
* Tower (B. napus)	1974	Low < 5%	Low
* Regent (B. napus)	(New)	Low < 5%	Low
* Candle (B. campestris)	(New)	Low < 5%	Low
Eltex (B. napus)	(New)	Low	Low
Low Erucic			
* Midas (B. napus)	1973	Low < 5%	High
Oro (B. napus)	1968	Low < 5%	High
Zephyr (B. napus)	1971	Low < 5%	High
* Torch (B. campestris)	1973	Low < 5%	High
* Span (B. campestris)	1971	Low < 5%	High
Normal Erucic			
Target (B. napus)	1966	Normal 20-40%	High
Turret (B. napys)	1970	Normal 20-40%	High
Echo (B. campestris)	1964 Revoked 1975	Normal ≃ 26%	High
Polar (B. campestris)	Revoked 1975	Normal ≃ 26%	High
High Erucic			
* R-500 (B. campestris)	(New)	High ≃ 55%	High

*. . . These varieties will most likely be grown in Alaska. New varieties listed may or may not be licensed at this time. Zephyr, Oro, and Target are no longer recommended in Canada. Echo and Polar had licenses revoked in Canada in 1975. Target, Turret, and R-500 should be grown on contract only.

TABLE 3: YIELDS OF RAPESEED VARIETIES TESTED AT FAIRBANKS AND DELTA-CLEARWATER IN 1977.

Variety	Genus - Species	Type	University Experimental Farm,[a] Fairbanks bu/acre[c]	(kg/ha)	Lee Fett's Farm,[b] Delta-Clearwater bu/acre[c]	(kg/ha)	Average bu/acre[c]	(kg/ha)
Tower	Brassica--napus	Argentine	47.2	(2646)	27.2	(1525)	37.2	(2085)
Oro	Brassica--napus	Argentine	41.3	(2315)	25.1	(1407)	33.2	(1861)
Zephyr	Brassica--napus	Argentine	32.9	(1844)	22.1	(1239)	27.5	(1541)
Midas	Brassica--napus	Argentine	41.0	(2298)	29.7	(1665)	35.4	(1984)
Target	Brassica--napus	Argentine	38.9	(2180)	26.0	(1457)	32.5	(1822)
Turret	Brassica--napus	Argentine	38.0	(2130)	21.3	(1194)	29.7	(1665)
Span	Brassica--campestris	Polish (Turnip)	38.2	(2141)	30.0	(1682)	34.1	(1911)
R-500	Brassica--campestris	Polish (Turnip)	46.1	(2584)	22.9	(1284)	34.5	(1934)
Torch	Brassica--campestris	Polish (Turnip)	31.4	(1760)	36.3	(2035)	33.9	(1900)
Echo	Brassica--campestris	Polish (Turnip)	43.1	(2416)	32.0	(1794)	37.6	(2107)
		Average	39.8	(2231)	27.3	(1530)	33.6	(1883)

[a] The test plots at Fairbanks were planted May 16 on summer-fallowed land. Fertilizer was applied at the rate of 250 lbs 20-10-10 per acre (50 lbs N/acre, 25 lbs P_2O_5/acre, and 25 lbs K_2O/acre).

[b] The test plots at Delta-Clearwater were planted May 20 on oat stubble land which was chisel-plowed the previous fall. Fertilizer was applied at the rate of 330 lbs 20-10-10 per acre (66 lbs N/acre, 33 lbs P_2O_5/acre, and 33 lbs K_2O/acre).

[c] The standard test weight of rapeseed is 50 lbs/bu. To convert bu/acre to lbs/acre, multiply by 50. To convert bu/acre to hundred weights divide by 2.

TABLE SOURCE: Frank J. Wooding, Associate Professor of Agronomy, Agricultural Experiment Station, University of Alaska, Fairbanks, Alaska.

TABLE 4: YIELDS OF 2 RAPESEED VARIETIES PLANTED EARLY, MID-WAY, AND LATE AT 3 INTERIOR ALASKA LOCATIONS.

Test Site Location	Planting Date		Variety: Tower bu/acre[d]	Tower (kg/ha)	Variety: Torch bu/acre[d]	Torch (kg/ha)
University Experiment Farm,[a] Fairbanks	Early - (May 10)		48.0	(2690)	48.1	(2696)
	Midway - (May 21)		42.2	(2365)	38.0	(2130)
	Late - (June 3)		32.7	(1833)	33.1	(1855)
		Average	41.0	(2298)	39.7	(2227)
Lee Fett's Farm,[b] Delta-Clearwater	Early - (May 6)		27.1	(1519)	32.3	(1810)
	Midway - (May 18)		32.9	(1844)	23.9	(1340)
	Late - (June 1)		19.7	(1104)	22.5	(1261)
		Average	26.6	(1491)	26.2	(1469)
OHM Farm,[c] Delta-Clearwater	Early - (May 6)		11.4	(639)	24.6	(1379)
	Midway - (May 19)		17.0	(953)	20.5	(1149)
	Late - (June 2)		2.9	(163)	12.1	(678)
		Average	10.4	(583)	19.1	(1071)

[a] The test plots on the University Experimental Farm were grown on summer-fallowed land. Fertilizer was applied at the rate of 250 lbs 20-10-10 per acre (50 lbs N/acre, 25 lbs P_2O_5/acre, and 25 lbs K_2O/acre).

[b] The test plots on Lee Fett's Farm were grown on oat stubble land (straw baled off) which was chisel-plowed the previous fall. Fertilizer was applied at the rate of 330 lbs 20-10-10 per acre (66 lbs N/acre, 33 lbs P_2O_5/acre, and 33 lbs K_2O/acre).

[c] The test plots on the OHM Farm were grown on summer-fallowed land. Fertilizer was applied at the rate of 330 lbs 20-10-10 per acre (66 lbs N/acre, 33 lbs P_2O_5/acre, and 33 lbs K_2O/acre). Yields were reduced by weeds and by severe wind erosion which resulted in loss of topsoil and fertilizer.

[d] The standard test weight of rapeseed is 50 lbs/bu. To convert bu/acre to lbs/acre, multiply by 50. To convert bu/acre to hundred weights divide by 2.

TABLE SOURCE: As in Table 3.

TABLE 5: CANADIAN RAPESEED GRADES.

Grade Name	Standard of Quality Degree of Soundness	Standard of Cleanness
No. 1 Canada	Reasonably sound, cool and sweet; may contain not over 3% damaged seeds, including not over 0.1% heated. Of good natural color.	May contain not more than 1% of other seeds that are conspciuous and that are not readily separable from rapeseed, to be assessed as dockage.
No. 2 Canada	Cool and sweet; may contain not over 10% damaged seeds, including not over 0.5% heated.	May contain not more than 1.5% of other seeds that are conspicuous and that are not readily separable from rapeseed, to be assessed as dockage.
No. 3 Canada	May contain not over 20% damaged seeds, including not over 2.0% heated, may have the natural odor associated with low quality seed, but shall not be distinctly sour, musty, rancid, nor have any odor that would indicate serious deterioration or contamination.	May contain not more than 2% of other seeds that are conspicuous and that are readily separable from rapeseed, to be assessed as dockage.

TABLE SOURCE: Grain Grading Handbook for Western Canada. August 1, 1975. Canada Grain Commission, Winnipeg, Manitoba.

SEEDING

Seed to be planted should be of no lower quality than certified. Varietal features can be lost through outcrossing and admixture in commercial production.

Seeding Rate and Depth

Canadian growers use seeding rates of 4 to 6 pounds per acre. In 1976, in field trials with Torch and Tower at Beaver Lodge and Ft. Vermillion, Alberta, 6 and 8 pounds per acre, respectively, were used. A 7-pound rate was used in the Alaska trials in 1977. Seed should be sown to a depth of 1 to 1 1/2 inches.

Time of Seedling

Polish varieties require 85-90 days to mature. In date-of-planting studies, Torch seeded in late May of 1976 at Beaver Lodge, Alberta, showed the highest-yield oil content in the seed, oil per acre and protein per acre, but lower protein content in the seed. In trials during 1977 at Fairbanks and Delta Junction, Alaska, Torch showed the highest yield at the date of planting (May 10). Canadian experiments indicate that a decrease of 2 bushels per acre for a crop of 20 bushels per acre can be expected for every week planting is delayed past the third week in May. A delay past May 21 in Alaska resulted in a decrease of approximately 2 1/2 bushels per acre per week for an average of 35 bushels per acre.

Argentine varieties require 90-110 days to mature. In date-of-planting studies at Beaver Lodge in 1976 the mid-May planting date was best for Tower. In Fairbanks, Alaska, Tower had the highest yields for the May 10 planting date and in Delta Junction, Alaska, for the May 21 planting date. A decrease of 4 bushels per acre per week for a 48-bushel crop occurred in Fairbanks by delaying planting after May 10. In Delta Junction, a 6 1/2-bushel decrease per week occurred for a 33-bushel crop by delaying planting after May 21.

Seed Bed Preparation

The seedbed should be firm and uniform with moisture within 1 inch of the surface. If possible, the surface should be made up of 35-40% fine material. Only enough clods should remain to prevent wind erosion. Soil should be worked shallowly to about 2 1/2 inches, just to break the surface. The seedbed should be weed free, moist and firm.

Spring Frost

Rape seedlings survive light spring frosts. If heavy frost blackens the leaves, the plants will generally recover in 4 to 5 days. Even if as many as two-thirds of the seedlings are frost-killed, it is not advisable to re-seed. Reseeding generally results in lower yields.

FERTILIZATION

Rapeseed has a high fertility requirement. Nitrogen is the most limiting nutrient followed by phosphorus. A 30-bushel-per-acre crop contains 293 pounds of nitrogen (N), 88 pounds of phosphorus (P_2O_5), 179 pounds of potassium (K_2O), and 18 pounds of sulfur (S). About one-half the N and S, two-thirds the P_2O_5, and one-third the K_2O are removed in the seed crop. Considerable amounts of N and K_2O are returned to the soil if the straw is incorporated. The fertilizer requirements for a given soil and cropping condition can only be determined by a soil test. Fertilizer rates used in the 1977 Alaska trials are shown in Table 6.

TILLAGE PRACTICES

Tillage practices for rapeseed differ little from those used for small grains except in the preparation of the seedbed. Because of the danger of soil erosion from wind, good conservation tillage methods should be used. Minimum tillage methods which will still maintain high yields and disease and weed control should be practiced.

No research on tillage methods for rapeseed production has been conducted in Alaska. Data from areas with climatic and soil conditions similar to Alaska hve been used when making recommendations. Equipment complements recommended include disks, packers, chisel plows with sweeps, and rod weeders for cultivation. Disks may be needed for production on new lands. However, for previously cultivated lands, sweeps, chisels and rod weeders will permit minimum tillage while incorporating stubble and maintaining soil moisture and weed control.

When the main limiting factor in crop production is soil moisture, care must be taken in tillage. Minimizing moisture loss in the spring is extremely important. The soil should not be worked so thoroughly that it is powdery and fine leaving the surface vulnerable to moisture loss and wind damage. The top 1 1/2 to 2 inches should be loosened as early as the soil can be tilled in spring. Fall winds near Delta Junction can also be damaging to the soil. As much stubble as possible should be left on the field after harvest in the fall and incorporated in the soil in the spring on areas to be cropped. If any tillage is performed in the fall, it should be shallow, within 3-4 inches of the surface. Weed control should be accomplished with herbicides whenever possible. A soil which is maintained in good tilth will hold moisture and will maintain good fertility.

TABLE 6: FERTILIZER RATES IN THE ALASKA TRIALS, 1977.*

Location	N	P_2O_5	K_2O	Fertilizer	Land Condition
	----------lbs/acre----------				
Fairbanks	50	25	25	(20-10-10) 250 lbs	Summer fallow
Delta Junction (Lee Fett)	66	33	33	(20-10-10) 330 lbs	Oat stubble, straw removed, chisel plowed previous fall
Delta Junction (OHM)	66	33	33	(20-10-10) 330 lbs	Summer fallow

* Broadcast application.

TABLE 7: HERBICIDE APPLICATION RATES RECOMMENDED IN CANADA.

	Active Ingredients	Product
	-------rate per acre (fluid oz.)--------	
Cobex	11 oz.	44 oz. (25% active)
Treflan	12 oz.	24 oz. (50% active)

CROP MANAGEMENT

The maintenance of soil moisture and fertility, and the control of weeds and diseases are important considerations in crop production. Rapeseed is used in rotation with fallow and alternate crops. Canadian recommendations state that rapeseed should not be seeded on land sown to rapeseed in the previous two years. This minimum rotation period is required to break disease and insect cycles. If disease or insect problems become severe, up to 5 years between rapeseed crops is recommended.

Rotation

A rapeseed rotation generally includes rapeseed, an alternate crop and a fallow season. Although rapeseed can be placed in a rotation with various crops, small grains particularly barley, are recommended as the alternate crop for Alaska. The sequence suggested is fallow - rape - small grain. Although the proportion of rapeseed sown on fallow land varies from year to year and province to province, 78% of the rapeseed grown in Canada from 1969 to 1973 was sown on fallow land. Rapeseed has a high N and moisture requirement. Therefore, production on fallow ground is advisable. If a small grain follows the rapeseed crop, 2,4-D or MCPA can be used to control volunteer rapeseed. Additionally, small grain harvest prior to fallow will insure a sufficient trash cover during the fallow season. If rapeseed follows grain, the stubble should be cultivated in the fall and again in spring to insure a good seedbed.

Rape Residue

Cereal and oilseed crops may be damaged by toxins leached from rapeseed residue. Damage is generally confined to the area below the windrow. Rapeseed residue uniformly spread is apparently not toxic. Losses on crops following rape can be avoided by using resistant varieties and a good straw spreader on the combine.

Fairly Resistant Crops:

Feed Barley - Pallisar, Galt, Jubilee
Oats - Glen, Harmon, Rodney
Spring Wheat - Saunders, Neepawa

Very Susceptible Crops:

Rape - all varieties
Barley - Herta, Fergus
Oats - Eagle, Sioux
Spring Wheat - Park, Manitou, Thatcher, Chinook, Cypress

Yield Maximization

There are six requirements for production of a high yield rapeseed crop.

1. Weed Control: This has always been the biggest problem in rapeseed production. Wild oats are a problem in Canada. Lambs-quarter will also be a problem in Alaska.

2. Adequate fertility: Both N and P_2O_5 are limiting nutrients. Fields should be soil tested to determine fertility requirements.

3. Soil of good tilth: If good conservation tillage practices are used, tilth can be maintained and erosion by wind can be reduced.

4. Proper cultivation: Rapeseed requires high moisture in the soil. Cultivation should be fallow. The seedbed should be moist, firm and weed free.

5. Seeding practices: Use of high quality seed sown to a depth not exceeding 1 1/2 inches at an approximate rate of 6 pounds per acre should produce optimum conditions for good germination and crop yields.

6. Checking fields: Rapeseed can suffer from disease and insect infestations. Fields should be checked after spring seeding so that controls can be implemented if needed.

WEEDS AND INSECTS

Weeds are a major problem in rapeseed production. Although herbicides are available, none have been registered or labeled by the Environmental Protection Agency (EPA) for use on rapeseed in Alaska. Application has been made for the registration and labeling of appropriate herbicides through the IR-4 program and through the Alaska Department of Environmental Conservation. It is hoped that herbicides for weed control in rapeseed will be cleared for use in Alaska before the 1980 growing season.

Two herbicides recommended in Canada for weed control in rapeseed are Treflan and Cobex. Either of these herbicides can be applied as a spray in the spring and incorporated with a field cultivator set approximately 4 inches deep. Incorporation is accomplished by two passes over the field at right angles to each other made within 24 hours of application of the herbicide. If either herbicide is applied in the fall, it should be applied when air temperature is approximately 50°F. When the seedbed is worked the following spring, it should not be worked below the treated layer. Herbicide application rates recommended in Canada for Cobex and Treflan are shown in Table 7.

Weed populations can be controlled with cultural methods. The following five recommendations are made if these methods are used:

1. Do not let weeds develop. Use high quality seed and eradicate all patches of perennial weeds.

2. Practice good tillage methods in the spring.

3. Delay seeding for wild oat control.

4. Proper fertility will allow the rapeseed to compete with the weeds.

5. Use summer fallow.

Insects should not be a major problem in Alaska. Cabbage root maggots will damage rapeseed. To control cabbage root maggots, cruciferous weeds should be destroyed for two years prior to planting rapeseed. Rapeseed should not be planted on rapeseed stubble. There is no insecticide cleared in Alaska as yet for the control of root maggots in rapeseed.

DISEASES

Rapeseed is susceptible to disease. The Argentine varieties appear to be more resistant than the Polish varieties, however. During 1971 to 1976, a 15-20% loss in rapeseed yield was experienced in Canada because of diseases. Root rot accounted for 50% while staghead accounted for 20-30% of this loss. Diseases of rapeseed are classified as either root diseases, foot rots, or above ground diseases. Table 8 lists the diseases and shows symptoms and controls.

PRODUCTION COSTS

Rapeseed production methods differ little from those used for barley. Therefore, to estimate costs of production for rapeseed in interior Alaska, the costs of production on 3,000 acres for the 1/2 and 1/3 fallow systems of barley production were adjusted as follows:

1. Fallow operations were performed with

   42' disk and packer
   42' tandom disk
   28' chisel plow
   335 HP 4WD diesel tractor.

2. Combine time for barley was doubled.

3. A dessicant for ripening was assumed to be custom applied.

4. Herbicide costs were increased to $6.00 per acre using the cost of Treflan at $30.00 per gallon and a 24 oz. application rate.

Tables 9 and 10 showed costs for producing rapeseed alone and in rotation with barley.

HARVESTING

Rapeseed shatters easily and requires careful judgment in selecting the time of harvest. Two methods are used for harvest, either direct combining or swathing before harvesting. In excessively moist fall conditions, dessicants may have to be applied prior to harvest to promote field drying.

Direct Combining

Rapeseed is ready to combine when the moisture level reaches 10%, the seeds are mature, or fall frost has stopped further ripening. The crop can be combined under weather conditions which make small grain harvesting difficult. A ripened rapeseed crop dries more quickly after a rain or dew than does a small grain crop.

Care should be taken to plug all leaks or holes before combining. The pick-up speed should coincide with the forward speed of the combine. The cylinder speed should be set about half the speed used for combining grains. A low combine fan speed should be used to minimize blowing. All precautions should be taken to minimize excessive return of the seed. This promotes cracking and overloading of one section of the machine. Straw should always be spread as it comes from the combine.

Swathing

Swathing is a common practice in Canada. However, because of the possibility of high fall winds in the Delta-Clearwater area, light rollers would probably have to be used to anchor the swath in the stubble. If a roller is used, it should be set high enough to anchor the swath without shattering pods. Excessive rolling results in slow drying and shattering loss if the combine pick-up has to pull the swath out of the stubble.

Rapeseed is ready to swath at 35% moisture when the majority of the seeds are in the firm dough stage or starting to turn brown. The seeds will mature in the swath and have good color and high oil content. The swather should cut the crop just below the seed pod. The swath should be smooth and care should be taken not to beat the plants, but to lay them gently over the cutting bar. When a moisture level of 10% is reached in the swath, the crop is ready to combine.

TABLE 8: DISEASES OF RAPESEED.

Disease	Symptom	Control
Root Diseases		
Damping off	No germination or emergence, or growth stagnates at 1-4 leaf stage.	Seed when soil sufficiently warm @ 1-1 1/2" depth and fertilize properly.
Brown Girdling Root Rot	Light brown, irregularly shaped lesions on tap root or main laterals progressing upwards toward soil surface.	No control. Argentine varieties appear resistant.
Foot Rots		
Sclerotina Stem Rot	Pale gray stem lesions above ground line. Spores can germinate and survive several years in stubble and debris.	Use clean seed, a 4-year rotation and remove rapeseed debris.
Foot Rot	Brown, hard, lesions at base of stem. Under wet conditions spores are extruded.	As above.
Above Ground		
Blackleg and Ringspot	White to grey lesions with black fruiting bodies on stems or purplish colored lesions. Seed is infected and spreads to succeeding crops. Fungus survives in debris and stubble.	Rotate with non-susceptible crops. Incorporate or remove debris and stubble. Control volunteer rape. Use clean seed.
Blackspot, Grey Leaf, Spot, Pod Drop	Brown to black dots on leaves. Pods fail to develop or will contain infected seeds. Spores will spread to healthy plants.	No control. Argentine varieties resistant.
Staghead	Caused by complex of white rust and downy mildrew. Spores emitted from stagheads in final stages. Spores survive several years in soil and carried with, not in, the seed.	Use clean seed. Control volunteer rape. A 5-year rotation is required. Argentine varieties appear immune.

TABLE 9: ESTIMATED COSTS FOR PRODUCING ONE ACRE OF RAPESEED ON A 3,000 ACRE FARM UNIT USING 1/3 AND 1/2 FALLOW MANAGEMENT.

	1/2 Fallow Tractors: 335, 175 HP Combines: Two-20 ft			1/3 Fallow Tractors: 335, 175 HP Combines: Two-24 ft		
OPERATING COSTS						
1. Planting and Tillage						
a. Equipment	$25.26			$17.80		
b. Fertilizer[a]	18.61			18.61		
c. Seed[b]	4.20			4.20		
d. Herbicide	6.00			6.00		
		$52.57			$ 45.11	
2. Harvest Equipment		11.18			11.54	
3. Farm Transportation		8.61			7.58	
4. Miscellaneous		4.88			3.66	
5. Rapeseed Drying		10.14			9.29	
6. Interest at 9%		3.48			3.54	
Total Operating			$ 92.36			$ 82.22
OWNER COST						
1. Equipment		18.67			18.19	
2. Buildings		1.55			1.21	
3. Land Lease		15.96			11.97	
4. Management Return		6.92			6.44	
Total Owner			$ 43.10			$ 37.81
Total Cost			$135.46			$120.03
Cost/bushel (Estimated Production of 30 bu/acre)			$ 4.52			$ 4.00

[a] 200 lbs urea and 50 lbs of 11-48-0.

[b] Seeding rate @ 6 lbs/acre.

TABLE 10: COSTS OF PRODUCTION FOR RAPE, BARLEY, AND RAPE-BARLEY ROTATIONS USING A 3,000 ACRE UNIT WITH 1/3 and 1/2 FALLOW MANAGEMENT.[a]

	100% Rapeseed	50% Rapeseed 50% Barley	100% Barley
1/2 Fallow			
Per Acre	$135.46	N?A	$108.69
Per Bushel Average			$ 1.81
1/3 Fallow			
Per Acre	$120.03	$110.93	$101.83
Per Bushel Average[b]	$ 4.00	$ 2.94	$ 1.87

[a] Rapeseed is produced after fallow. Barley follows rapeseed.

[b] Barley yield on second-year crop will be 50 bushel per acre for a production cost of $2.04 per bushel.

DRYING AND STORAGE

Until recently, a moisture level of 10 - 10.5% has been considered safe for storage. Recently, however, it has been found that rapeseed deteriorates rapidly at moisture levels over 9.5%. A maximum air temperature which is considered safe for drying to obtain these moisture levels is 110°F.

Drying

Rapeseed spoils rapidly unless dried or kept cool by aeration. It is possible to bin dry rapeseed with air at approximately 10-20°F. However, the following should be kept in mind:

1. Air does not move readily through rapeseed.
2. Three times as much air pressure is required to move air through one foot of rapeseed than through one foot of wheat.
3. Hot spots form quickly and promote rapid spoilage. Therefore, adequate stirring action is required.

Heated air dryers are also used for rapeseed. The following cautions are expressed:

1. Fine screens should be used to prevent seed from passing directly through the drying bin.
2. The drying capacity for rapeseed is lower than for grains.
3. Air temperatures in excess of 110°F are not recommended.
4. Rapeseed must be cooled to a seed temperature below 60°F immediately after drying.
5. Germination tests on seed should be made before and after drying to check for heat damage.
6. Overheating will damage oil quality.

Storage

Tight storage bins are required to contain the seeds which will flow freely through small openings. The auger speed should be kept low to avoid cracking. After placement in the bins, temperatures should be checked every day for a week after harvest, and once a week thereafter. If there are hot spots, recycling should begin immediately. After a week of storage, several hundred pounds should be taken from the bottom of the bin and put

on top. Heating, a major problem in storage, can be caused by leaking bins, condensation in bins, respiration of seed on hot days, green weed seed in the crop, and immature seed in the stored crop. All precautions should be taken to eliminate these causes.

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