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Potential Sunflower Production In Idaho

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Sunflowers are one of the few crops raised in the U. S. that are native to North America. North Dakota, Minnesota, South Dakota and Texas currently produce most of the sunflowers raised in the U. S. Two types of sunflowers are produced. The oil type produces a high quality vegetable oil and high protein meal. The non-oil type is used as human food and for bird feed. In the midwest, average seed yields of the oil-type sunflowers are 900 to 1,100 pounds per acre; non-oil types yield about 100 pounds per acre less. Yields of 2,000 pounds per acre on dryland and 3,000 pounds per acre under irrigation have been attained with good management.¹

Testing sunflowers in Idaho was begun in 1976 in response to three problems. They were:

- (1) depressed prices of wheat
- (2) increased disease and insect problems of peas, and
- (3) increased soil erosion caused by re-cropping winter wheat.

Adding a crop such as sunflowers in the wheat-pea rotation could provide

¹Information from "Sunflowers, Production, Pests and Marketing," North Dakota State University Ext. Bull. 25.

greater market opportunities, improve profits and reduce soil erosion. Crop rotations could be lengthened which would reduce disease and insect problems associated with shorter rotations. An additional spring crop could reduce erosion associated with fall planted crops.

Initial Tests

Two varieties of oil-type sunflowers were evaluated in northern Idaho in 1976 and 1977 (Table 1). Under dryland conditions, seed yields and oil contents have compared favorably with seed yields obtained in North Dakota. Both 'Hybrid 894' and the open-pollinated variety 'Peredovick' appear well adapted to most of our test areas. Higher seed yields have been obtained from these varieties under irrigation.

Birds have damaged mature heads at most locations. Drought and herbicide damage were apparent at the dryland test site at Bonners Ferry in 1977. No

serious insect pests were observed but some plants at Grangeville in 1976 were attacked by white mold [*Sclerotinia sclerotiorum* (Lib) De Bary]. Sunflowers matured in early September in most of our trials.

Variety Trials

In 1977, the national sunflower variety trial was obtained from the National Cottonseed Production Association, Inc. in Memphis, Tennessee (Table 2). This trial contains commercial hybrids and open-pollinated varieties adapted to a wide range of environments. This trial was grown under dryland conditions at Moscow and under irrigation at Aberdeen and Coeur d'Alene. Because seed was limited, single rather than 4-row plots were seeded at Aberdeen.

Moscow - Dryland

This trial was seeded April 28 and harvested August 23. Seed yields were reduced by drought but still averaged 1,258 pounds per acre (Table 3). Seed

Table 1. Seed yield and seed oil content of two varieties of oil-type sunflowers tested in Idaho in 1976 and 1977.

Location	Year	Hybrid 894		Peredovick		Precipitation	
		Seed yield	Seed oil ¹	Seed yield	Seed oil ¹	Planting to harvest	Total
		lb./acre	%	lb./acre	%		
Dryland sites							
Moscow	1977	1631 a ²	40.4	1420 ab	42.0	7.4	15.2
Grangeville	1976	1109 ab	43.3	909 bc	43.5	8.2	25.2
Bonnars Ferry Valley	1976	1210 a	38.8	992 a	38.5	6.3	23.6
Bonnars Ferry Valley	1977	768 ab	41.8	927 a	40.8	4.8	10.3
Irrigated sites							
Coeur d'Alene	1977	3504 ab	39.2	3776 a	42.0	—	—
Bonnars Ferry Bench	1977	3440 a	47.9	2913 b	47.6	—	—

¹Determined by the nuclear magnetic resonance method at the Eastern Montana Agricultural Center, Sidney, Montana.

²Means within a row not followed by the same letter differ at the 0.05 level of probability by Duncan's new multiple range test.

Table 2. Sunflower types and sources of varieties tested in Idaho.

Variety	Pollination type	Seed company
Cal/West 894	Hybrid	Cal West Seed Company
Cal/West 903	Hybrid	Cal West Seed Company
Cargill 204	Hybrid	Cargill, Inc.
Sun-Gro 372-A	Hybrid	Growers Seed Assoc.
Sun-Gro 380	Hybrid	Growers Seed Assoc.
Peredovick	Open Pollinated	Interstate Seed Company
Hybrid 8943	Hybrid	Interstate Seed Company
Sputnik	Open Pollinated	North Dakota State University
Sunbred 254	Hybrid	Northrup King and Company
Sunbred 223	Hybrid	Northrup King and Company
Sunbred 212	Hybrid	Northrup King and Company
Sun Hi 301A	Hybrid	Pacific Oil Seeds Inc.
Sun Hi 304	Hybrid	Pacific Oil Seeds Inc.
Master X	Hybrid	Rauenhorst and Bellows (Ag. Pro.)
Big Top	Hybrid	Rauenhorst and Bellows (Ag. Pro.)
Sigco 894	Hybrid	Sigco Sun Products

Table 3. Seed yield and seed oil content of 16 varieties of sunflowers tested under dryland conditions at Moscow in 1977.

Variety	Seed yield	Test weight	Plant height	Seed oil ¹
	lb/acre	lb./bu	inches	%
Sunbred 223	1779 a ²	27.7	41	41.7
Sunbred 212	1746 a	30.9	52	45.1
Hybrid 8943	1666 ab	27.4	52	42.1
Sun-Hi 304	1599 abc	25.7	46	40.2
Peredovick	1586 abc	26.4	48	41.6
Sun-Grow 380	1484 abcd	23.9	51	42.0
Sun-Hi 301A	1475 abcd	25.6	48	43.1
Cal/West 894	1433 abcd	25.7	51	40.1
Sunbred 254	1419 abcd	26.1	54	43.0
Master X	1417 abcd	29.6	43	40.3
Sigco 894	1397 abcd	25.7	49	40.2
Cal/West 903	1363 abcd	29.6	46	41.0
Sputnik	1360 abcd	25.9	48	46.6
Sun-Gro 372-A	1132 bcd	21.6	62	39.5
Cargill 204	1052 cd	25.7	46	39.5
Big Top	907 d	28.1	48	38.7
Mean	1258	26.6	49	41.5

¹Determined by the nuclear magnetic resonance method at the Montana Eastern Agricultural Center.

²Means not followed by the same letter differ at the 0.05 level by Duncan's new multiple range test.

yields ranged from 908 to 1,779 pounds per acre with the shorter, earlier maturing genotypes having an advantage in the extremely dry conditions.

Oil content ranged from 39 to 45%, averaging 42% (Table 3). A minimum of 40% oil is required for sale of sunflower seed without dockage. Each percent below 40% is docked 0.1% of current market price. A premium of 0.1% is paid for each percent oil is above 40%.

Irrigated Trials

Irrigated trials located 6 miles northwest of Coeur d'Alene on the Rathdrum Prairie and at Aberdeen were seeded April 21 and May 23, respectively. Harvest dates were September 16 at Coeur d'Alene and October 15 at Aberdeen.

Seed yields averaged 2,416 and 4,287 pounds per acre at Coeur d'Alene and Aberdeen, respectively (Tables 3 and 4). No statistical differences in seed yield were observed among varieties in either trial, but the later-maturing varieties appeared to be well adapted to these conditions. Oil content and test weights were generally higher under irrigation than under dryland.

Sunflowers for Silage

Silage yields of sunflower varieties grown at Moscow in 1977 ranged from 7.8 to 15.7 tons per acre, averaging 11.5 tons (Table 5). Sunflower and corn raised for silage at Moscow from 1920 to 1925 averaged 14.8 and 8.6 tons per acre, respectively. At Sandpoint during this same period, sunflower and corn yielded 11.5 and 3.8 tons per acre, respectively. These data indicate that silage production from sunflowers will be higher than silage production from corn in many northern Idaho areas. Nutritional values of the two are comparable, as measured as milk production.

Production Requirements

Planting and Seedbed

Sunflowers can be planted with a conventional corn planter or with some precision grain drills. Most conventional drills will require some modifications to get uniform spacing of plants within the row. Row widths can be from 20 to 40 inches and should be based on the spacing requirements of the header used in harvest. Row widths should be wider under dryland conditions and narrower under irrigation.

Final plant populations should be 14,000 to 19,000 plants per acre under

dryland conditions, 20,000 to 25,000 under irrigation or if sunflowers are planted for silage. Populations higher than 25,000 plants per acre may result in lodging. Spacing between plants within rows if rows are 36 inches apart would be 11.2, 8.3 and 6.3 inches for 14,000, 19,000, and 25,000 plants per acre, respectively.

Seedbed preparation should leave soil moist and firm but not compacted. The soil surface should be rough enough to minimize soil loss from wind and water erosion.

Place seed into moist soil not deeper than 3 inches. Plant about the same time as spring cereals when soil temperatures are 45 to 50°F. Sunflower seedlings will tolerate some frost, but are susceptible to frost damage during flowering. Late planting will reduce yields, require seed drying, delay harvest and increase the possibility of bird damage. Sunflowers require the entire growing season to mature.

Fertilizers

Fertilizer recommendations have not been developed in Idaho. In the midwest a 2:1:2 ratio of nitrogen, phosphorus and potassium is generally used. For each 1,000 pounds per acre of seed, 50 pounds of nitrogen, 15 to 30 pounds of P₂O₅, and 20 to 50 pounds of K₂O was required. Potassium may not be required in northern Idaho because most soils have adequate levels of potash. In southern Idaho, potassium will be required on soils low in this nutrient. Sulfur limits production of many crops in both northern and southern Idaho and probably will be needed in those areas for sunflower production.

Crop Rotation

Sunflowers are susceptible to Verticillium wilt (*Verticillium albo-atrum*) and white mold (*Sclerotinia sclerotiorum*) and may increase these disease problems if planted in the same rotational cycle with crops susceptible to these diseases. Peas, beans and potatoes are susceptible to white mold. Potatoes are also susceptible to Verticillium wilt.

Crops following sunflowers should not require a residue-free seedbed and should be tolerant to 2,4-D which is used to control volunteer sunflowers.

Weed Control

A combination of cultural practices and herbicides is recommended for weed control. Treflan (trifluralin), Ep-

Table 4. Seed yield and seed oil content of 16 varieties of oil-type sunflowers grown under irrigation at Coeur d'Alene and Aberdeen, 1977.

Variety	Coeur d'Alene ¹				Aberdeen ²	
	Seed yield	Test weight	Plant height	Seed ³ oil	Seed yield	Seed ³ oil
	lb./acre	lb./bu	inches	%	lb./acre	%
Sputnik	2778 a ⁴	29.7	70	46.5	4880 a ⁴	43.0
Sun-Gro 372A	2726 a	30.4	75	44.5	5140 a	39.2
Hybrid 8943	2713 a	30.8	69	43.0	3840 a	37.0
Sunbred 254	2712 a	30.6	63	43.9	4200 a	36.2
Sun-Hi 304	2605 a	29.8	63	42.5	4620 a	34.1
Sun-Gro 380	2556 a	32.6	77	44.7	5120 a	41.5
Sunbred 212	2513 a	31.0	64	41.9	—	—
Cargill 204	2488 a	29.2	66	42.5	5000 a	34.0
Sun-Hi 301A	2323 a	33.1	70	44.0	4200 a	41.1
Cal/West 903	2319 a	30.1	51	41.3	3620 a	36.5
Big Top	2289 a	26.3	60	44.7	4540 a	35.4
Cal/West 894	2154 a	27.9	63	43.3	4800 a	35.8
Peredovick	2117 a	25.7	61	41.7	3260 a	37.2
Sigco 894	2114 a	28.2	61	43.8	4240 a	35.5
Sunbred 223	1827 a	27.3	46	40.3	2980 a	35.7
Oil Master X	—	—	—	—	3860 a	38.0
Mean	2416	29.5	64	43.2	4287	37.3

¹Herbicide — Treflan 0.6 lb a.i./a on April 6; Fertilizer — 80 lb. N, 100 lb. P₂O₅, 70 lb. SO₄; Irrigations — June 1, July 1, August 1 with 1¾ to 2 inches per irrigation.

²Herbicide — none; Irrigations — June 24; July 11, 20, 29; August 1, 12, 22, with about 1½ inches per irrigation.

³Determined by the nuclear magnetic resonance method at the Montana Eastern Agricultural Center.

⁴Means not followed by the same letter differ at the 0.05 level by Duncan's new multiple range test.

tam (EPTC), Amiben (chloramben), Tolban (profluralin)² and Carbyne (barban) are chemicals used in the midwest for weed control. Eptam is registered for use only in Minnesota, South Dakota, and North Dakota. Wild oats, mustards, and nightshades are likely to be the biggest weed problems. Read and use label recommendations for use of these chemicals in Idaho.

Harvesting and Drying

Sunflowers should be harvested when seed is at 20 percent moisture or less. Check seed in the center of the head for ripeness because these seeds ripen last. Bracts on the outer edge of head should be brown to black when plants are mature.

Paraquat at 1 to 2 pints per acre can be used to defoliate the crop after it is mature to enhance the drying process before harvest. Be sure to read and follow label instructions.

Sunflower seed is harvested by direct combining. Most small grain combines can be adapted to harvest sunflowers with header attachments that facilitate harvest. Cylinder speed should be about 300 to 400 rpm. When the crop is dry, concave clearance should be wide open.

If some seed is left in the head, a narrower concave clearance can be used. Some growers have used a front concave clearance of 1 3/4 inch and a rear concave clearance of 1 inch.

Harvesting sunflowers at high moisture (20%) usually results in higher yields, less bird damage and less shattering. However, seed must be dried before storage. Sunflowers dry easily

Table 5. Silage yields at 70% moisture and plant height of 16 varieties of sunflowers grown at Moscow, 1977.

Variety	Silage yield	Plant height
	tons/acre	inches
Sun Gro 372-A	15.7 a ¹	62
Sun Gro 380	15.0 ab	51
Sun Hi 301-A	14.6 abc	48
Cal West 894	13.3 abcd	51
Sun Hi 304	12.3 abcde	46
Sigco 894	12.3 abcde	49
Hybrid 8943	12.0 abcde	52
Sunbred 254	11.7 abcde	54
Sputnik	10.7 abcde	48
Sunbred 212	10.7 abcde	52
Cargill 204	10.6 abcde	46
Sunbred 223	10.6 abcde	46
Peredovick	10.1 bcde	48
Master X	9.7 cde	43
Cal West 903	9.2 e	46
Big Top	7.8 e	48
Average	11.6	49

¹Means within the column not followed by the same letter differ at the 0.05 level of probability by Duncan's new multiple range test.

²Do not graze or feed to livestock if profluralin is used.

because of their low test weight and large air spaces between seed. Drying temperatures of 160 to 220°F do not harm the yield or quality of oil. Sunflowers to be used as seed should not be dried at temperatures over 110°F.

Fire hazards exist when drying sunflowers because of fibers rubbed loose from the seed and the high oil content of the seed. Before drying sunflowers check for fire hazards that could be associated with your drier.

Marketing - Contracts

Before planting sunflowers, one should obtain a contract or be assured of a firm market. At the present time marketing facilities in the northwest are somewhat limited. Development of an oilseed processing plant in the northwest and shipment of whole seeds to foreign markets appear feasible. However, neither of these alternatives are currently established.

Should I Plant Sunflowers?

Before planting sunflowers, we suggest the following:

- (1) Make sure that the production requirements for sunflowers fit your crop rotations and equipment.
- (2) Secure a contract or firm market.
- (3) Initially plant on a small acreage.
- (4) Contact your local seed elevator or county agent for additional details.

Peredovick, an open-pollinated sunflower, has yields comparable to most hybrids under dryland conditions of northern Idaho. Because of lower seed cost and good yields, this variety is recommended for initial dryland production. Under irrigation and in longer growing seasons, 'Sputnik' (an open-pollinated type) and some hybrids (Table 4) are better adapted than Peredovick.

Further testing will be needed before additional variety recommendations can be made for the dryland and irrigated regions of Idaho. Initial results indicate that most commercially available varieties will yield well under normal moisture conditions. Under dry conditions and shorter growing seasons, those varieties that mature early may give a yield advantage. Even the earliest varieties will probably not mature until early September under most growing conditions.

An excellent publication on sunflower production is available from North Dakota State University. This publication is *Sunflower Production, Pests and Marketing*, Extension Bulletin 25, North Dakota State University, Fargo, North Dakota 58102. The price of this publication was \$2 in 1975.

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