



Management Tips for Flax Production

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**Management Tips for
Flax Production**
Prepared by L.L. Hardman
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A Brief History -

Minnesota Flax Yields and Acreage, 1903-2003

Uses/Markets -

Growth and Development -

NCIS Adjusters Sketches
Drawings of Roots, 1928

Production Areas -

Choice of Fields -

Crop Replant and Rotational Restrictions Following Corn & Soybean

Varieties -

NDSU Variety Descriptions & Performance Data, East and West Locations
SDSU Performance Data & Variety Descriptions

Seedbed Preparation -

Planting Dates, Rates & Methods -

Weed Management -

Flax: Cultural and Chemical Weed Control, 2004 edition
Crop Replant and Rotational Restrictions Following Corn & Soybean
Weed Management in Organic Cropping Systems Penn State Agronomy FS64

Nutrient Management -

U of M Nitrogen, Phosphorus and Potassium recommendations

Harvest Management -

Crop Cleaning and Storage Management -

Appendix -

Organic Certification Process Chart
North Dakota Flax Seed Producers List
Minnesota Flax Seed Producers List
South Dakota Flax Seed Producers List
Other References

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A Brief History

- **Brought by colonists to United States: Used fibers from stems for linen cloth, linseed oil from the seed for paints or wood preservatives, and meal for livestock feed after oil was extracted from the seeds.**
- **As population spread westward demand for paint jumped and flax production soared.**
- **A huge oil and paint industry developed in the country's major flax growing areas (Minnesota and the Dakotas). The first manufacturer of prepared paints in the USA was located in the Twin Cities.**
- **By the 1940's Minnesota produced half of the country's flax.**
- **Flax production critical during the World Wars.**
- **Acreage dropped sharply after WWII and again as synthetic fibers were developed.**
- **Almost disappeared by 1980 as latex paints replaced oil based paints.**
- **Revival of interest in the crop because of availability of newer varieties which produce healthy edible oil (Omega 3) for use by humans.**

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**Minnesota Flax Yields and Acreage
 1903-2003***

<u>Year</u>	<u>Acres (x 1000)</u>	<u>Yield bu/A</u>
1903	655	9
1913	390	8
1923	527	10
1933	682	6
1943	1,579	9
1953	1,090	9
1963	592	12
1973	231	14
1983	75	13
1993	10	17
2003	8	23

***Data from Minnesota Ag Statistics Service**

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Uses and Markets

- **Contains 32-44% oil (dry weight basis) Approximately 20 pounds or 2.6 gallons of oil comes from each bushel of flaxseed. (Varies by variety and climatic conditions of crop year)**
- **Linseed oil's value was as a drying oil (forms a thin film when exposed to air). This quality was the result of a largely polyunsaturated fatty acid component in the oil (especially linolenic acid). The oil was used in paints and preservative mixes and even as a component in household floor covering staple linoleum (from the scientific name of flax is Linum usitatissimum).**
- **After the oil is extracted from the seed, the remaining material is ground or pressed into pellets for livestock feed formulations. Prized for its high palatability and high quality protein content (34%).**
- **Flax straw has short fibers and has been used to produce cigarette and fine bond paper.**
- **Whole flax seed and oil from some of newer varieties are now valued for their health benefits. Plant breeders have changed the fatty acid composition of the oil so that it closely resembles that of the known healthy oils from fish. A new industry is developing around these products, especially if they are organically produced.**

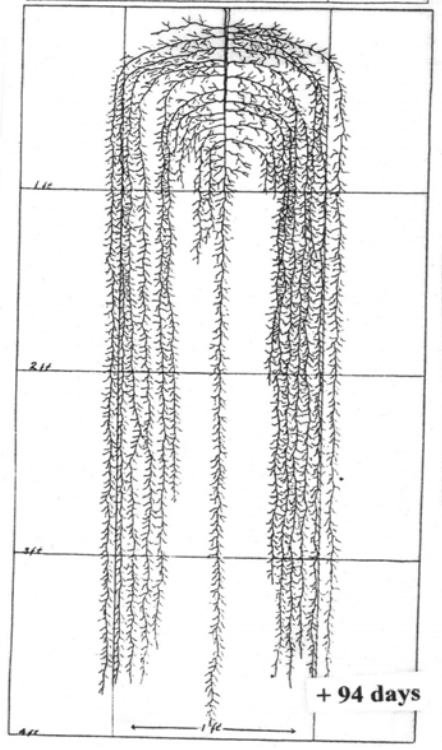
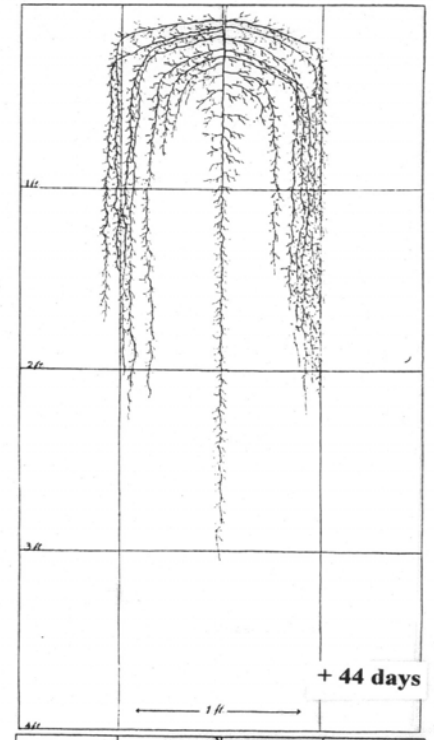
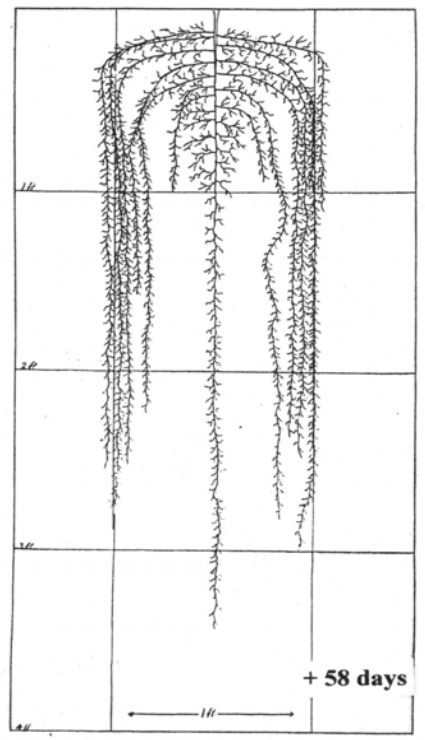
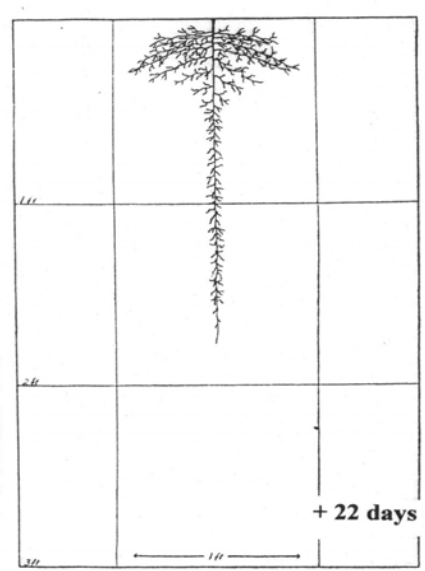
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Growth and Development

- **Seed flax is an annual plant that grows to a height of 12 to 36 inches.**
- **It has a distinct main stem with numerous branches at the top which produce flowers. The plant has a short-branched taproot system, which may extend to a depth of 3 to 4 feet in lighter soil.**
- **The flax flower has five petals and produces a five-celled boll or capsule, which may contain 6 to 10 seeds.**
- **Flax normally is self-pollinated, but insects cause some natural crossing.**
- **Individual flowers open in the first few hours after sunrise on clear, warm days, and the petals are shed by noon. Most commercial varieties have blue petals.**
- **A vegetative stage (Pre-flowering) takes about 50 days, followed by a flowering period of about 25 days, with another 35 days required to achieve maturity.**
- **Seed can be yellow, brown, greenish-yellow, greenish-brown, or nearly black in color, however seed of most commercial varieties is a light brown color.**

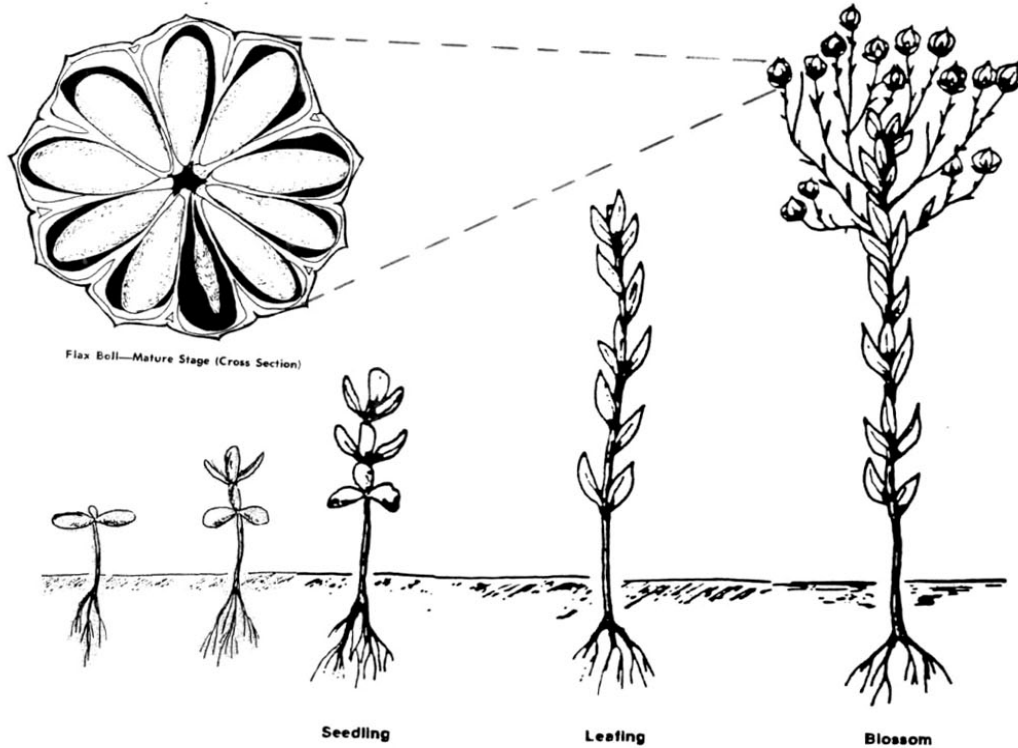
Roots of Flax



Arny A.C. & I. J. Johnson 1928. The Roots of Flax Plants. The Journal of the American Society of Agronomy. Vol. 20(4): 373-380.

GROWTH STAGES OF FLAX

STAGE	DEFINITION	TIME INTERVAL TO NEXT STAGE
Seedling	From emergence to sixth leaf	14 days
Leaving	From sixth leaf to first bloom	30 days
Blossom	From first blossom to green boll	12 days
Green Boll	Green bolls forming through development of white seeds	18 days
Boll Ripening	When the bolls begin to turn color until kernels reach maturity	22 days



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Production Areas

- **Farms in North Dakota, Minnesota, South Dakota and Montana generally account for about 95-99 percent of the acres of flax production.**
- **This concentration of acreage may be explained by the larger acreage of fertile land, a lack of crops with more favorable economic returns, moderate summer temperatures and properly distributed rainfall.**
- **Adequate rainfall during the growing season is more critical than the total seasonal amount.**
- **Good moisture and cooler temperatures during the blooming to maturity period, seem to favor both high oil content and higher oil quality.**

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Choice of Fields

- **Fields suitable for corn and soybeans are suitable for flax. To the north and west of the Corn Belt, flax usually is grown in fields suitable for wheat or barley. Poorly drained land or land subject to excessive drought or erosion should not be considered.**
- **Special attention should be given to inserting flax into a good crop rotation. A satisfactory one should include (1) a small-grain; (2) a legume (alfalfa, soybean, or field bean); (3) a row crop (corn, soybean, etc); and (4) flax. In the Dakotas, where legumes and row crops are not commonly grown, flax is included in a rotation with a summer fallow, small grains for 2 or 3 years and flax.**
- **Rotational and crop replant restrictions for some of the herbicides used in a corn/soybean rotation may limit field choices. Consult the current edition of Cultural and Chemical Weed Control in Field Crops for the appropriate information.**
- **Flax has also been used as a companion crop for establishing small seeded grasses and legumes because of its limited leaf area and short stature which allows light to reach the young forage seedlings; its early maturity; and its lower soil moisture needs early in the season.**

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Crop Replant and Rotational Restrictions: For Flax Following Corn

<u>Herbicide</u>	<u>Specific Restrictions</u>	<u>Time Period</u>
Acetoclor (Harness, Surpass)	General	2 nd Cropping Season
Atrazine	General	2 nd Cropping Season
Dicamba (Banvel)	General	2 nd Cropping Season
Glyphosate	General	None
Mesotrione (Callisto)	General	18 months
Nicosulfuron (Accent, Steadfast)	General	18 months

Crop Replant and Rotational Restrictions: For Flax Following Soybean

<u>Herbicide</u>	<u>Specific Restrictions</u>	<u>Time Period</u>
Glyphosate	General	None
Imazethapyr (Pursuit)	General	40 months
Imazamox (Raptor)	General	18 months
Trifluralin (Treflan)	Spring applied	None
Pendamehalin (Prowl)	General	Next Crop Season

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Varieties

- **Variety descriptions and performance test results for varieties of flax currently being tested at several locations in North Dakota and South Dakota are provided in the attached tables. No single variety will be best for all locations. The University of Minnesota closed out its flax breeding and testing effort in 1984.**
- **Rust and wilt are two serious diseases of flax which can be managed by growing resistant varieties. Only those varieties known to be resistant should be planted.**

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Seedbed Preparation

- **A proper seedbed for flax needs to: (1) reduce the weed population, (2) conserve available soil moisture, (3) manage stubble and previous crop residue, and (4) create a firm seedbed.**
- **A well-prepared, firm seedbed will ensure planting at the proper depth. This will enhance rapid and uniform germination so the crop gets a head-start on weeds. This is important because flax seed germinates at a lower temperature than most of the troublesome grassy weeds.**
- **In higher rainfall areas and on heavier soils fall plowing followed by early spring field preparation is considered the best practice.**
- **Field cultivators, moldboard plows, and discs are commonly used for spring tillage. Working the seedbed with a harrow or packer immediately after spring plowing can firm the seedbed and conserve soil moisture.**
- **Flax has also been successfully established with no-till drill seedings in last years grain stubble. This method requires special attention to weed control using herbicides and other special practices.**

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Planting Dates, Rates & Methods-

- **Early seeding of flax in the North Central region generally produces the best stands and highest yields.**
- **Late April or early May seeding dates are recommended. These early planting dates allow the plants to flower and begin seed set in the cooler part of the summer.**
- **Light frosts can injure flax in the early seedling stage. Seedlings just emerging are the most tender, but can withstand a moderate frost.**
- **After the plants are 2 or 3 inches tall and hardened by exposure, they can survive temperatures as low as 25° F for a short time without serious injury.**
- **Flax is again susceptible to cold temperatures during flowering and early boll stages.**
- **Tests in Minnesota indicated that a delay of 10, 20, or 30 days after the first practical sowing date caused yield losses of 22, 23, and 47 percent, respectively.**
- **Although some yield will be lost of late plantings in North Dakota and northern Minnesota the crop can reach maturity before frost, especially if an early variety is used.**
- **Early varieties require nearly the same number of days to mature, regardless of planting date. Late varieties require a longer growing period as planting is delayed. Only early varieties should be used for late and very late planting dates.**

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Planting Dates, Rates & Methods (continued)

- **The recommended seeding rate for flax varieties with medium-sized seeds ranges from 20-30 pounds an acre(Montana and western Dakotas) to 43-56 pounds an acre(eastern Dakotas and western Minnesota). These rates would provide stands of 50-85 plants/ft.**
- **Uniform stands of flax are frequently obtained when the seed is treated with a suitable fungicide**

Seeding Methods

- **Plant shallow (3/4" to 1 1/2") in a firm seedbed with a grain drill.**
- **A drill with press attachments is better because it will compress moist soil against the seed which promotes rapid and uniform germination.**
- **A packer may be attached behind the drill, or the field can be packed in a separate operation immediately following planting.**

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Weed Management

- **The flax plants' small leaves and short, upright growth habit make flax a good companion crop for establishing grass or legume stands but make it a poor competitor with weeds.**
- **Unless a field is relatively free of weeds, the herbicides will likely be needed to obtain maximum production.**
- **The choice of herbicide will depend on the weed species present and the required application method (PPI, PRE, or Post) Consult the current edition of Cultural and Chemical Weed Control in Field Crops for appropriate information.**
- **Herbicides are available for control of several annual grasses and broadleaf weeds in flax. Rates used on flax, will not provide adequate control of perennial weeds. Perennial weeds should be controlled in the other crops in the rotation.**
- **Early spring tillage can stimulate wild oat seed germination and later tillage passes can then destroy these young weeds. Sometimes two or more flushes of weeds can be handled this way, but because flax planting will be delayed until late May or early June, yield loss will occur.**
- **Rotational and crop replant restrictions for some of the herbicides used in a corn/soybean rotation may limit field choices. Consult the current edition of Cultural and Chemical Weed Control in Field Crops for the appropriate information.**

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Nutrient Management

- **Flax requires a good fertility program to achieve the highest yields**
- **Program should be based on yield goals, soil test levels, previous crops in the rotation, organic matter content.**
- **See the current University of Minnesota Best Management Recommendations for Nitrogen, Phosphorus and Potassium on the attached tables.**

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Harvest Management

- **Flax may continue to bloom until frost, but many of these later blossoms will not set seed or will remain small enough to be lost during threshing and cleaning.**
- **Maturity in flax is judged by color of the bolls. The crop is ready to combine when about 90 percent of the bolls have turned brown.**
- **Flax may be harvested with a swather (windrower) or by direct combining. The most common method of harvest in the North Central Region is with the swather and windrow pickup attachment on a combine because most fields have many weeds.**
- **If a swather and pickup combine are used, harvesting a few days earlier will not affect yield or quality.**

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Crop Cleaning and Storage Management

- **Flaxseed shipped to market can exhibit 10 to 40 percent dockage from cracked flaxseed, other grains, weed seeds and chaff. This is most undesirable when extracting linseed oil, but this does not affect the value for feed.**
- **Items which result in dockage should be screened from the flax before marketing, but few farms and not all local elevators are equipped for such cleaning.**
- **Flax intended for seed should be recleaned with only the dry, sound, plump seeds saved.**
- **For safe storage, flaxseed should measure 11 percent moisture or less. Store in dry, secure bins. Flaxseed can flow through very small openings.**