

**CIHM
Microfiche
Series
(Monographs)**

**ICMH
Collection de
microfiches
(monographies)**



Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

© 1997

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

Coloured covers/
Couverture de couleur

Covers damaged/
Couverture endommagée

Covers restored and/or laminated/
Couverture restaurée et/ou pelliculée

Cover title missing/
Le titre de couverture manque

Coloured maps/
Cartes géographiques en couleur

Coloured ink (i.e. other than blue or black)/
Encre de couleur (i.e. autre que bleue ou noire)

Coloured plates and/or illustrations/
Planches et/ou illustrations en couleur

Bound with other material/
Relié avec d'autres documents

Tight binding may cause shadows or distortion along interior margin/
La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure

Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

Additional comments:/
Commentaires supplémentaires:

Pages of pamphlet trimmed with some loss of text.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	14X	18X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12X	16X	20X	24X	28X	32X

Coloured pages/
Pages de couleur

Pages damaged/
Pages endommagées

Pages restored and/or laminated/
Pages restaurées et/ou pelliculées

Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées

Pages detached/
Pages détachées

Showthrough/
Transparence

Quality of print varies/
Qualité inégale de l'impression

Continuous pagination/
Pagination continue

Includes index(es)/
Comprend un (des) index

Title on header taken from:/
Le titre de l'en-tête provient:

Title page of issue/
Page de titre de la livraison

Caption of issue/
Titre de départ de la livraison

Masthead/
Générique (périodiques) de la livraison

The copy filmed here has been reproduced thanks to the generosity of

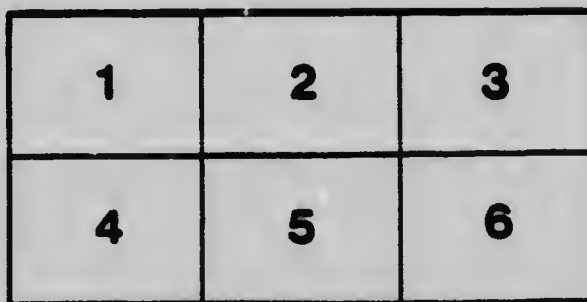
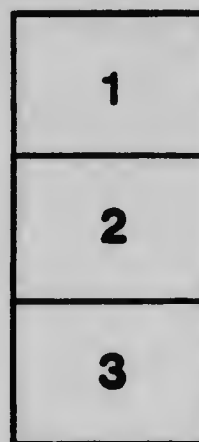
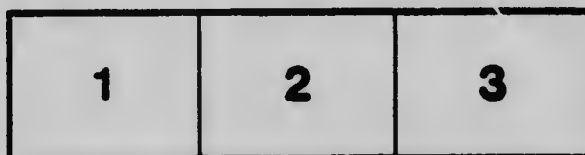
Metropolitan Toronto Reference Library

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche sheet contains the symbol \rightarrow (meaning "CONTINUED"), or the symbol ∇ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

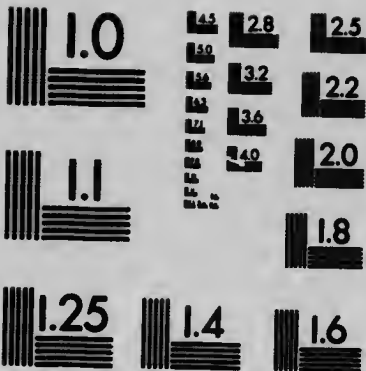
Bibliothèque de référence de la communauté urbaine de Toronto

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole \rightarrow signifie "A SUIVRE", le symbole ∇ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

BULLETIN No. 24

Government of the Province of Saskatchewan

DEPARTMENT OF AGRICULTURE

HINTS FOR FLAX GROWERS

BY

A. F. MANTLE.

*PUBLISHED BY DIRECTION OF
THE HONOURABLE W. R. MOTHERWELL, MINISTER OF AGRICULTURE*

(SECOND EDITION)



REGINA

JOHN A. REID, GOVERNMENT PRINTER
1911

PREFACE AND ACKNOWLEDGMENTS.

There is little or nothing in this bulletin that is new or original. It is intended to present a digest or summary of information concerning the growing and marketing of flax in so far as that information affects the farmer growing the crop in Saskatchewan. It is felt that at the present time in this province there is more need for a simple bulletin on this subject presenting in plain language facts that should be known to many persons but are certainly unknown to many. Many men for a more pretentious and learned publication. On the part of home-steads in the western and south-western portions of the province men are commencing to farm with little or no knowledge of their work, the soil, the climate or those laws of nature and plant life with which they must work in harmony if success is to reward their efforts. The first crop that most of these men will attempt to grow is flax. It is to assist in some measure these newly arrived settlers that this bulletin has been prepared and it is not intended to be a comprehensive treatment of the subject.

Information upon the subject has been drawn from many sources, but acknowledgments are due in particular to Dr. Wm. Saunders, Director of Experimental Farms, Ottawa; Mr. Angus MacKay, Superintendent of the Experimental Farm at Indian Head; Professor Bolley of the North Dakota Agricultural College, and Mr. Thos. Thompson, of Thompson, Sons & Co., grain commission merchants, Winnipeg. Much of the matter presented in the following pages is derived from their bulletins, reports, addresses and correspondence.

A. F. MANTLE,
Deputy Minister of Agriculture.

THE FLAX CROP

Flax is one of the oldest of our domesticated plants. Its known history dates back to early Biblical times. The Egyptian mummies are found wrapped in linen and mention is made of linen in connection with the erection of Joseph as virtual ruler of Egypt. It was probably introduced into America in the days of the Pilgrim Fathers and has been widely grown ever since. It can be grown in practically all parts of the North American continent where farming is carried on, but thrives best in those latitudes constituting the north half of the North Temperate Zone. Partly for this reason and partly because those states are among the ones most recently settled extensively, more than three-quarters of the flaxseed produced in the United States is grown in North Dakota, Minnesota and South Dakota. In the same way about nine-tenths of the flaxseed grown in Canada is produced in Southern Saskatchewan. The tables presented below reveal the growing importance of Saskatchewan in the flax raising industry of North America.

Production of flax in Saskatchewan and the United States in each year since 1902 and in Canada in 1901 and 1910, illustrating the increasingly important position occupied by Saskatchewan as a producer of that grain:

SASKATCHEWAN.

Year	Acreage	Yield	Acre yield
1910.....	396,230	3,044,138	7.68
1909.....	319,100	4,448,700	13.9
1908.....	264,728	2,589,352	9.78
1907.....	128,528	1,364,716	10.62
1906.....	76,005	710,689	9.35
1905.....	25,315	398,399	15.73
1904.....	15,917	166,434	10.45
1903.....	31,644	285,697	9.02
1902.....	16,694	153,709	9.80
Average yield for nine years.....			10.33

CANADA.

Year	Acreage	Yield	Acre yield
1910.....	476,877	3,802,000	7.97
1901.....	23,086	172,222	7.46

UNITED STATES.

Year	Acreage	Yield	Acre yield
1910.....	2,916,000	14,116,000	4.8
1909.....	2,742,000	25,856,000	9.4
1908.....	2,679,000	25,805,000	9.6
1907.....	2,864,000	25,851,000	9.0
1906.....	2,506,000	25,576,000	10.2
1905.....	2,535,000	28,477,000	11.2
1904.....	2,264,000	23,400,000	10.3
1903.....	2,233,000	27,300,000	12.2
1902.....	3,740,000	29,285,000	7.8
Average yield for nine years.....			9.2

Why Flax is a Popular Crop.

There are three good reasons for supposing that the rapid increase in the flax area of Saskatchewan revealed above will continue. One is the very satisfactory price that has been realised for flaxseed for a number of years past and particularly during the last twelve or fifteen months. Another is the comparatively small bulk of the product of an acre of this crop as compared with wheat or oats; this is an important consideration to men who must haul their grain 40, 50 or 60 miles to the nearest railway station or who must store it on the farm until the coming of winter affords them an opportunity to market it. The third reason is found in the fact that flax is the only grain crop that gives a satisfactory return as a rule when grown upon virgin prairie land in the same season that the land is first ploughed. Many assert that this latter practice—growing flax on freshly ploughed breaking—is poor farming and that the person following it is no farther ahead at the end of, say, three years than if the breaking had been left fallow throughout the first season. This may or may not be true as a general rule; it is a practice that will not be recommended in this bulletin, in any case. The fact must be borne in mind, however, in this connection that many of the settlers taking up virgin land in Saskatchewan have little capital and few resources. Any method of farming that offers to such men a reasonable certainty of quick and profitable returns is worthy of their serious and perhaps favourable consideration provided no permanent damage to their virgin farm is involved. Such men can perhaps afford to sacrifice a little advantage in later years, if such must be, in order to secure the speedy returns that the sowing of flax on newly ploughed breaking offers. For this reason, provided the flaxseed used is free from the seeds of noxious weeds and from flax wilt, this practice is not to be unhesitatingly or sweepingly condemned.

The only bad effect attributed to the growing of flax upon freshly ploughed breaking is on the decomposition or rotting of the prairie sod. It is freely asserted by some that the mechanical condition, or tilth, of the field which has undergone this treatment is not as good for a decade afterwards as it would have been had the field been left fallow

throughout the first summer. The truth probably is that its mechanical condition is greatly impaired and will remain so until it has been summerfallowed. Breaking properly conducted is only a summerfallowing of the prairie. If this operation, set in motion by the first ploughing, is interrupted and suspended by the sowing of a crop and its subsequent growth, it is evident that the advantages and results of a summerfallow cannot be looked for. Moisture cannot be stored in the soil, decomposition of organic matter (roots, leaves, etc.) cannot proceed as quickly and generally and the preparation and storing up of available plant food cannot take place. These three processes, of vital importance to succeeding crops, are almost dependent upon and inseparable from the summerfallow in the western half of Saskatchewan. If, instead of the summerfallow, flax is being grown, moisture used instead of stored, decomposition arrested instead of hastened, and plant food assimilated by the crop instead of made ready in the soil—the effect upon succeeding crops is almost certain to be felt. Should the months of June and July be wet in the following summer these ill effects that follow the growing of flax on newly ploughed breaking might not be met with otherwise they are almost certain to be in evidence. In view of this is it worth the while of large companies and farmers having capital—men who need not sacrifice the future to immediate returns—to sow even clean flaxseed upon their newly ploughed breaking?

Flax and the Wire Worm.

Mention should be made, too, of the value of the flax crop in Saskatchewan as a means of circumventing the wire worm. On some of the heavy soils of the province—notably in districts along the Regina Line and the Outlook-Macklin branch of the Canadian Pacific Railway and the Goose Lake branch of the Canadian Northern Railway—the presence and activity of wire worms have made the successful growing of wheat during the first one or two years an uncertain undertaking. The wire worms are the larvæ or an early stage in the development of click beetles. The eggs of these beetles are laid about the roots of grasses and other plants and the wire worms which result from them take two years to come to full growth. They are slender, yellowish, shiny and tough with six legs under the front of the body and a sucker-like foot under the end. When full grown they are about an inch long and a twelfth of an inch wide. No treatment of seed grain has proved effective against these insects which eat right into the kernel of grain itself and do not feed upon the stems or other parts of the plants as do most other insect pests. Wheat and oats are most subject to attack from wire worms, but, happily, flaxseed appears to be almost immune. Whether the reason or reasons for this immunity are we cannot state definitely but three present themselves for consideration. It may be that the flax seed itself by its smooth gelatinous exterior resists the attack of the wire worm; it may be that the seed is distasteful to the worm; or it may be that the flaxseed being usually sown nearer the surface is out of the sphere of activity of the insect in question. The fact that flax is practically immune from this pest is an important one and has certainly been of untold benefit to many farmers in the areas referred to above.

Preparation of the Soil for Flax.

Flax can be grown upon almost any land in Saskatchewan. Soil that will produce profitable crops of any other grain will usually do at least as well when sown to flax. This plant is not so particular about the kind of soil—whether heavy or light, clay or sand, chocolate loam or black mud, deep or shallow—as it is about the condition the soil is in. It will respond to a fertile soil and does best in this province on the heavy deep clay loam lands, but it will respond even more to a soil that has been thoroughly prepared for the crop. Flax is a fast growing crop by habit but has a small and delicate root system. For these reasons it requires to find liberal supplies of plant food available for its use at the outset. It is not a vigorous feeding crop, such for instance as oats is. It requires a deeply stirred seed bed that is firm almost to the top and has just sufficient loose soil on the surface to cover the seed uniformly. Therefore virgin prairie land, timothy or rye grass sod, summerfallow or corn land all make good forms of preparation for flax. These are suitable also because they tend to insure a seed bed free from weeds. Because it requires to grow rapidly yet is not a gross feeder, or a good "rustler," flax does not thrive when in competition with weeds. Flax should not be sown upon land fall ploughed to a depth of about five inches and which is dry, lumpy, and full of weed seeds that have not germinated; this is the worst possible preparation. If none of the forms of preparation named above is available, it may be sown upon land ploughed the fall before for the purpose of insuring early germination of the seed and spring ploughed to a depth of three or four inches about the middle of May or after a good growth of rubbish has been secured. Such land should be packed, rolled, or in some manner made firm immediately after ploughing and before being seeded.

When flax is to be sown on new land in the same season as it is broken the best method of preparation will usually be found to be as follows: plough the prairie sod from four to five inches deep and follow with a packer, roller, float, disc harrow loaded with stone or some other implement that will press the inverted sods firmly back on to the subsoil. If the breaking is being done prior to May 15th the field may be disc-harrowed to a depth of about 1½ inches, care being taken to avoid getting to the bottom of the sod or turning sods grass side up. Follow with the disc harrow with a drag harrow until a well pulverised seed bed is secured and then leave the field until the time for sowing the crop shall have come. By these means the best seed bed possible under the circumstances will be provided. If the breaking is being done between May 15th and June 5th the preparation of the seed bed should be as set forth above up to the point of disc harrowing. As the season is now getting late it would not be advisable to take time for the more thorough method. In order that the seed may quickly germinate and start to grow it had better be sown at once in the well packed sod, with a disc drill if one is obtainable, if not with a sharp shoe drill. The seed will then be in moist soil from the start although the desirable soil condition will not have been prepared. The drill should be followed immediately by a "float" or "planker" or by the drag harrows inverted, loaded lightly with poles and fastened together. This treatment will

cover the seed to a greater degree and provide some loose earth on the surface. The important points in these methods of preparing newly broken prairie for flax are that the furrows be well packed immediately after ploughing and that all the operations follow one another with no delay.

Varieties of Flaxseed.

The work of improving flaxseed has not been carried on so widely and energetically as has been the case with wheat, oats, and barley. The existing varieties are not so clear cut in their characteristics and in the opinion of some observers are not very firmly fixed in type. The creation of new varieties having desirable characteristics in a marked degree, and the improvement of existing older varieties by selection, operations that are now exercising widespread influence upon even the great mass of our seed supplies on the farms in the case of wheat, oats, and barley—these lines of work that have not progressed very far up to the present time.

In consequence there are not, in the commercial supplies of seed throughout the country, any clearly defined varieties. The source from which most of the flaxseed grown in Saskatchewan today has its rise in Russia. There the crop is very largely grown both for seed and fibre though the experience of that country has been identical with that of the United States, namely, that flax is a new land crop and cannot be profitably grown for its seed for more than a few years in succession. After investigating the flax industry throughout Europe, Professor Bolley, Botanist of the North Dakota Experiment Station has come to the conclusion that all the field flax now being grown may be included in two species. One of these is the common small-seeded, field flax (*Linum usitatissimum, L.*); the other includes the big-seeded varieties (*Linum humile, Mill.*). The first named species include several varieties the characteristics of which are not too sharply defined, such as the blue flowered, the white flowered, and the white seeded. The big seed species is mostly grown in southern Europe and the Argentine (a heavy producer of flaxseed) while the small seeded species is grown in the northern latitudes. Practically all the flaxseed grown in Saskatchewan is of the common small seeded species.

The Importance of Good Seed.

Since the average farmer need not as yet trouble himself about what variety of flax he shall grow, his task in securing good seed flax would seem to be simpler than is the case with wheat or oats. As a matter of fact, however, the securing of good seed flax in large quantities is a most difficult matter. In order to show in concise form just what a group of experts consider to be the requisite characteristics of good seed of the flax plant and what relative importance should be attached in their judgment to the several characteristics, a score card for seed flax—the first that has ever been drawn up—is reproduced below. This score card was prepared by the faculty of the Saskatchewan College of Agriculture for use in connection with the seed fairs of Saskatchewan held last winter. It has also had the advantage of revision by Professor Bolley.

SCORE CARD FOR SEED FLAX.

Purity.

Possible score.

1. Freedom from weed seeds.....	20
2. Freedom from other kinds of grain and useless impurities	10

Quality of Grain.

1. Freedom from evidence of flax wilt and other diseases....	20
2. Grain sound, well ripened, free from frosted or otherwise damaged grains	15
3. Containing a high percentage of oil as indicated by glistening surface and slippery feeling when grasped by the hand.....	12
4. Colour, glossy dark brown, uniformly bright, not weathered	5
5. Grain uniformly plump, relatively large. The measured bushel well above standard weight.....	18
Weight per bushel pounds.	

Total.....	100
------------	-----

(Standard weight per bushel, 56 pounds.)

It will be noted that the two most important characteristics of good seed flax are its freedom from weed seeds and from evidences of flax wilt.

Prevalence of Weed Seeds in Seed Flax.

It is important that any grain intended for seed shall be free from weed seeds, but it is doubly important in the case of flaxseed. With the possible exception of wild oats the seeds of our worst noxious weeds can be almost entirely removed from wheat, oats or barley provided sufficient time is spent on and care taken with the work of separation. In the case of flax, on the contrary, wild oats is almost the only noxious weed seed that can readily be separated from the grain. Certainly the seeds of half a dozen of our most noxious weeds—including stinkweed and several of the mustards—can be separated from flaxseed only with the greatest difficulty, if at all, by the farmer's fanning mill. When it is remembered, too, that most of the seed flax is sown upon virgin land, the importance of securing and using only the cleanest seed is further emphasised. Indeed, it may well be questioned whether, in view of the above facts, freedom from weed seeds should not receive an even larger allotment of points on the score card than it already has. If a supply of seed flax that is free from the seeds of noxious weeds cannot be secured, it is far better to let the new land lie fallow throughout the summer in which it is broken, than to pollute that land at the very outset of its usefulness with trash that will cause trouble and loss and worry as long as the field is under cultivation. Every farmer has some weeds and most have some noxious weeds; but no man should, on that account, wilfully add to the number by deliberately sowing seed that contains them. There are thieves in the world and always have been, but civilised nations endeavour to reduce the number and check their operation rather than deliberately add to their number, because they cannot be entirely eliminated and because it would cost less to abandon the attempt.

There is one source of clean flax available to all. This is the seed plot on the home farm. Each farmer who intends to grow flax as one of the regular crops on his farm, particularly as a crop with which to subdue new land, should plan to start a seed flax plot on which to grow his next year's supply of seed. By growing the seed on a small plot it becomes quite possible, even under the labour conditions of the average Saskatchewan farm, to go through the crop on the seed plot carefully several times during the growing season and pull what weeds and other foreign plants may be found growing there. The labour involved in this task will be amply rewarded by the increased return from the crop grown from the seed secured in this way, aside from the satisfaction of growing a crop that will be practically free from weeds.

The Disease Known as Flax Wilt.

If the most important requirement of seed flax is freedom from weed seeds, the next requirement is freedom from wilt. Flax wilt is a fungus disease of the flax plant discovered many years ago, and experimented with in a variety of ways ever since, by Professor Bolley. A characteristic of flax in America has been that the yield speedily dropped from a highly profitable to a distinctly unprofitable level when the crop was extensively grown without rotation in any district for a short term of years. In consequence the crop has become nomadic in character, constantly seeking new localities, and has been used almost exclusively as the first crop sown upon virgin lands that were being brought under cultivation. It was commonly thought that flax must be very exhaustive of soil fertility or at least of some element in the soil essential to the production of the crop. Others thought that by growing flax some deleterious chemical compound was formed in the soil that rendered the field unfit for the production of that crop in future. It was left to Professor Bolley to unearth the real cause of the trouble when he discovered about ten years ago, that—to use his own words on the subject—“Flax sick soil is occasioned by the presence of a fungus, *Fusarium lini* Bolley, which may be introduced to new soil areas by way of the seed flax, and when once in the soil propagates with rapidity. Flax plants are destroyed by it at all ages of growth from seed time to maturity. About four years cropping to flax suffices to destroy the usefulness of the soil for the growth of the crop, if disease bearing seed is used. The flax crop has also been found to be subject to the attack of other destructive parasitic plants, but this one alone was found to be widespread in its distribution and sufficiently destructive to fully account for the disappearance of flax as a general crop in all but a few of the north-western states.”

Until a few years ago flax wilt was almost unknown in Saskatchewan. This condition was largely due, probably, to the fact that the crop was only grown extensively on the Soo line of the Canadian Pacific Railway in Southern Saskatchewan, and there only on new land. Sometimes two successive crops were taken, but flax was only used as a means of reducing the soil to such a condition that it would grow wheat. In consequence the flax area changed so rapidly that the disease had small chance to spread. Now, however, the crop is being grown

by many farmers because it is the most profitable of all cereals at present prices, and flax is following flax on old flax land. These are the conditions favourable to wilt and the disease is rapidly spreading over the flax areas of the province. At the provincial seed grain fair held at Regina in January, 1911, every exhibit of flax contained the characteristic scaly or scale covered seeds that indicate the presence of wilt.

The remedies are simple and two in number: (a) Flax should not be sown for at least five years on land that has produced a wilt-infected crop, as evidenced by the dying-off of many plants at different stages of growth but chiefly at early stages, and by the scaly appearance of the flaxseed. (b) Wilt-infected seed (which means practically all) should be treated before being sown.

Regarding the first measure it may be pointed out that in countries and in districts where flax is grown in moderation as one crop in a long rotation, wilt has made little or no headway. On the experimental farm at Indian Head, Mr. Angus MacKay, the superintendent, reports the disease is unknown. On inquiry it is learned that the crop is always grown on summerfallowed land and the land is again summerfallowed the following season. If flax is to be one of the permanent crops of Saskatchewan agriculture, it must be given a regular place in rotations and not grown year after year on the same field. Experience shows the best place for flax in a rotation to be after clover or grass or after summerfallow.

Respecting the second measure it may be pointed out that no careful farmer now neglects to treat his seed wheat to kill the smut spores, and an increasing number treat their oats. Why, then, need there be any hesitation concerning treating seed flax for wilt? The solution to be used is identical in the three cases, although no two of the diseases are the same. It may be pointed out that the damage to the flax crop from wilt is greater than that done to the wheat crop by smut. Smut seldom does little to reduce the yield of wheat; it chiefly impairs the quality and thus the value of the grain. Wilt, on the other hand, actually causes the total destruction of flax plants and thereby reduces the yield anywhere from a fractional amount to 35 or 70%, while, at the same time, impairing the quality and consequent value of what flaxseed is harvested. The old adage "an ounce of prevention is worth a pound of cure" clearly applies here with great force.

As to the manner of treating flax for wilt prevention Professor Bolley has the following to say:

"The method of seed treatment now followed on many North Dakota farms is essentially as follows: Good, bright, plump flaxseed is selected and cleaned in a fanning mill until only heavy-weight seed remains, blowing out all bits of straw, chaff, dust and scaly seeds. The formaldehyde solution is made to the strength represented by sixteen avoirdupois ounces of standard 40 per cent. formaldehyde to forty gallons of water. The cleaned flaxseed is laid upon a canvas or tight floor in quantities of five to ten bushels, and the seed is gradually moistened by use of a fine spray thrown from a small force pump, while it is being rapidly shovelled or raked over. In this manner the flaxseed rapidly moistens over its external surface, and can be thoroughly dampened without causing it to mat together, the process taking one-half gallon of solution per bushel of dried seed. It is of advantage to cover the pile of seed with a canvas or blanket for a few hours after treatment to keep the exterior of the pile from drying too rapidly. Grain thus treated, when once or twice shovelled over, will readily run through an ordinary drill in a couple of hours after treatment."

It may be added that where the force pump referred to is not obtainable, the solution may be applied with a common watering-can fitted with a fine rose, or in any way that will insure the liquid being divided into fine streams. More shovelling will be required in this case. It is most important that the flaxseed be kept by stirring from forming lumps or caking, as, if this is allowed to happen, loss will result. It should be borne in mind that, while the treating of seed flax entails more labour than is the case with wheat, for instance, the quantity of seed required for a given acreage is not more than half that of wheat and one-third that of oats.

Sowing the Flax Crop.

The period during which the flax may with safety be sown in Saskatchewan is none too long. From May 15th to June 5th will be found in the average season to constitute the proper period. On late soils—a term which includes heavy land, scrub lands rich in decaying vegetable matter, and districts having more than the average annual rainfall—the period of safety is shorter, and June 1st may be regarded as the latest date for the sowing of flax. When the spring has been late in opening up, on the other hand, and there is in consequence less likelihood of heavy killing frosts occurring late in May or early in June, it may be quite safe to sow flax earlier than May 15th. Between the above dates, however, May 15th to June 5th will be found to be the period of safety, if not of certainty, in most years.

Flax usually ripens, in Saskatchewan, in from 85 to 90 days.

As has been stated, the flax plant develops a poor root system. In consequence it is advisable that the crop have a good start and fair development before the trying period of heat arrives. Therefore it is better to sow flax in the earlier rather than the latter part of the period referred to. In the experience of many the crop may better run the risk of spring frosts than of being poorly developed when the hot dry weather occurs. The importance of not leaving the sowing of flax until June, and certainly not until the middle of that month, was emphasised in the summer of 1910 when so much of the flax crop of new settlements was totally destroyed, chiefly because it had been sown too late on ill-prepared land and had not developed the root system to withstand the dry weather and hot winds that occurred while the crop was still in its early stages. On the other hand the plant requires good growing conditions right at the outset because of its delicacy and poor rustling qualities and because of its fast growing and maturing habit. Hence the danger on the other hand from sowing too early in the season.

As in the case of other grain crops the correct amount of seed to sow per acre can only be determined by the individual farmer after he has become familiar with his soil, its moisture holding capacity, fertility, mechanical condition, etc. Only the limits of maximum and minimum sowing can be stated and the principal factors that should determine the quantity to be sown. It will seldom be found necessary or advisable to sow more than 80 pounds or less than 30 pounds of flaxseed per acre when the crop is being grown for its seed. On a well worked, fairly heavy summerfallow containing plenty of moisture and

available plant food, 80 pounds of seed can be sown with advantage. The soil can nourish the resulting number of plants and bring them to full development and maturity. On spring or fall ploughing or freshly ploughed breaking (prairie sod)—land which is not likely to be well supplied with moisture or available plant food—sowing at the rate of 30 or 40 pounds per acre will usually be found to afford a stand of plants that will fully tax the capacity of the soil. In districts lying west of the third meridian it will be well not to sow more than 30 pounds per acre. These districts as a whole are more liable to experience conditions of drought than are those farther east and lighter sowing is always desirable when the rainfall may be insufficient to bring to maturity a heavy stand of plants. Then, again, lighter sowing is advisable on fields that are in a rough condition, as, on such land, with a small and slippery seed such as flax, it is likely that the seeder will actually sow more than the tally indicates, or than it has been set to sow. Flax is not a stooling crop; only one stem results from a seed. But just above the ground, if the stems are not too close together and are well supplied with growing materials, a number of branches will be thrown off. Thus a bushy plant with relatively large leaf surface is developed and such a plant will have the capacity to produce and carry to maturity a larger amount of seed than would the spindly, unbranched plant resulting from a too heavy sowing. On the other hand if less than 40 pounds is sown there is the possibility that all the land may not be occupied as the plant has so small a root system and the danger that the maturity of the crop may be delayed and the crop thus encounter fall frosts.

The seed should not be sown very deep because it is so small. From three-quarters to one and a half inches is the correct depth; hence the necessity for having the seed bed firm practically right to the surface. To sow seed one inch deep in a loose unpacked soil in the latter half of May is to court trouble, for such seed will probably lie there until rain comes. To sow the seed of a delicately rooted plant on a hard impenetrable seed bed is also to invite trouble for the rootlets can only make but slow progress and derive little nourishment in such an environment. Hence the desirability of a deeply stirred but well packed seed bed with sufficient loose soil on the surface to cover the seed properly. If a packer or roller is available, it may be used to good advantage after the seeder. This will hasten germination, insure a more even stand and place more plant food within easy reach of the tiny rootlets thrown out by the seed, but such rolling or packing should be followed the same day by a drag harrow to restore light soil mulch. This treatment will also enable the crop to be harvested to better advantage.

Harvesting the Flax Crop.

When grown for seed, flax should be cut when the seeds are full and ripe, of a good rich characteristic bright brown colour and rattling freely in the boll when shaken or moved. It is not advisable to leave the crop standing after it is fully ripened. Some recommend this in order that the leaves of the plant may be killed off by frost. There is some risk that the flaxseed may also be injured, and that the crop may

not be sufficiently dry when threshing time comes, if cutting has been deferred until the season of short days and lamp mornings has arrived. The essential thing is that the crop be dry when threshed. Because of this and of the tenacious nature of the straw, it is not necessary or customary to use twine when cutting flax with the binder. Some farmers simply run the crop through the binder exactly as in the case of wheat, for instance but using no twine in the knotter. Others remove the knotting device, place in position the flax harvesting attachment that is obtainable for every make of binder sold in the province, and harvest it in that way. Still others remove only the trip, packers and discharge arms of their binders and run the crop through without gathering it into bundles; the long windrows thus made being raked into piles after the grain has become thoroughly dry. The crop is seldom stacked, usually being threshed from the shock, stook or pile, and the work is done with an ordinary grain separator suitably adjusted. The customary charge for threshing flaxseed is from 15 to 18 cents per bushel, the thresher supplying outfit, teams, men and board (sometimes), while the farmer hauls away the flaxseed and boards the teams. The flaxseed is hauled from the threshing machine in bulk in tight wagon boxes either direct to the elevator or car, or to the farmer's granary, there to await his leisure before being marketed.

Some Data on Flax Markets.

In a letter written some months ago, Mr. Thomas Thompson, senior member of the well known grain commission firm of Thompson, Sons & Co., supplied the writer with some interesting data on the flax markets of the world. As his firm probably has been for many years the largest seller of flax on the Winnipeg Grain Exchange, Mr. Thomas Thompson is well qualified to speak upon this subject. Following are some extracts from Mr. Thompson's letter:

"Our opinion has hitherto been that the farmers of Western Canada will never under ordinary conditions go extensively into growing flax. This opinion is based on the experience and observation of over twenty-eight years in the grain business west of the Red river and close contact with the farming community during that period.

"In the early days of settlement between twenty and thirty years ago flax was not grown anywhere in the West except in the Mennonite settlements in Southern Manitoba. These people had no doubt been used to growing flax in Russia, where they principally came from. For some years they were the only source of supply for such Canadian demand for flaxseed as was extant at that time, except for the little grown among the German and Dutch settlements in Ontario. Later on, Germans and other settlers from continental Europe who settled in the neighbourhood of Balgonie and other districts in Saskatchewan (Assiniboia at that time) began to raise flaxseed in moderate quantities.

"The Mennonites in Southern Manitoba were given practical encouragement to raise flax by the Livingstons of Baden, Ont. (now the Dominion Linseed Oil Company), because at about that time they had embarked on the oil crushing business and the domestic Canadian market was increasing. The Livingstons supplied seed to the Mennonites and in other ways encouraged them to grow flax. An oil mill was also built at Winnipeg by Boddy & Noakes, the requirements of seed for which helped to make competition in buying and stimulate the production of flax on the Mennonite reserve in the early years of settlement. The growing of flax, however, never seemed to commend itself to settlers from Eastern Canada or from the United Kingdom. We remember well, along in the early '90's, when from some cause the price

of flax advanced considerably and at one point was as high as \$1.85 per bushel in Duluth, that the public press, ever ready to advise the farmer how he should farm, recommended the growing of flax as something that would abound to much profit. Quite a number took the advice of the inexperienced press writers and tried growing a little flax. They bought seed at \$2.50 to \$3.00 per bushel, but money was scarce and many only planted 10 to 20 acres—too small a quantity to make it worth while bothering with. Then the following season flax prices were away down again, the little patches of flax got very poor attention in harvesting and threshing and that was the end of flax growing in Manitoba with all but the old Mennonite settlers. It was not until the American settlers began to come into the West by the Soo Line that any important increase in flax growing in Western Canada began to take place. Their method was to sow flax on breaking and no doubt the chance of getting a quick, good paying crop in this way has encouraged the growing of it even when the price was only moderately high.

"Up till the time when production began to increase by the growing of flax in the newer parts of Saskatchewan the yield of flax in all Canada provided very little surplus for export. In fact the Livingstons up until four or five years ago always imported some from Duluth. Up until two years ago flax came into Canada duty free. There is now a duty of 10 cents per bushel which in practice comes to about 6 cents per bushel owing to a drawback on cake exported. The oil crushing business in Canada has never grown to a great industry, probably because the oil required for domestic use in the earlier days was not large and there would be practically no demand for oil-cake. In the eastern part, where the bulk of the oil would be needed, it could be easily imported from Europe at probably less cost than it could be manufactured from home grown seed and the fact of the moderate cost of imported oil and the habit of getting it from that direction no doubt tended to stifle any probable efforts to raise sufficient seed to employ the manufacturer, so that it was not until the West began to open up and the general development of the whole country called for increase in supply of oil that the manufacturer began to apprehend the opportunity of business and then before he could get an adequate supply of seed to enable him to supply and push the trade he had to coax and encourage the grower to raise it. The great development all over Canada in the last few years in the matter of railways, general building and manufactures must have increased the demand immensely for linseed oil, but even yet, we do not think Canada requires much over one million bushels of seed to supply her own requirements.

"The principal oil crushing plant in Canada is that of the Dominion Linseed Oil Company at Baden, Ont., and they have also a small plant at Montreal, built four years ago. There are other two plants at Montreal, the Canada Linseed Oil Company and the Sherwin-Williams Paint Company. The only other crushers in Canada which we know of are the Canada Paint Co. (formerly Boddy & Noakes), and the Manitoba Linseed Oil Company with plants at Winnipeg. The Winnipeg mills use around 125,000 bushels of seed per year each and we estimate that the Dominion Linseed Oil Company and the other eastern crushers will now use among them 750,000 bushels or perhaps fully more than that.

"We think it was not until the season of 1907 that the flax crop in Canada began to assume more than domestic importance and it was not until the crop of 1909 that it became so large as to provide a considerable surplus for the export market. The crops of 1909 and 1910 have each been approximately 5,000,000 bushels and nearly all of this has been produced in the Province of Saskatchewan. The large influx of new settlers into Saskatchewan with their method and habit of raising flax and the great advance in the price of flaxseed in the last two years have combined to cause the large increase in production. The one cause without the other would not in our opinion have tended to anything like such an increase in Western Canada.

"The big increase in the price of flax has also arisen through a combination of circumstances which have developed almost simultaneously. In the first place the increase in all kinds of public works all over the world and increase in manufactures and building of all kinds which started a few years ago and which has probably reached its culmination for a time, caused a large increase in the demand for many commodities, oils and fat substances among the rest.

"In the midst of this increased and increasing demand the production of oil seeds began two years ago to sustain a considerable decrease through partial crop failures. First the cotton crop in the southern United States in

1908 and 1909 was very short owing to dry weather and that meant a big decrease in the production of cotton seed oil. A gradual and heavy advance in the price of cattle, hogs and sheep was the result of a decrease in numbers and it caused animal fat to become dear and the supply to decrease. The principal growers of flaxseed are North and South Dakota and Minnesota and contiguous States in the United States, also Argentine and India and a moderate quantity is grown in Russia and Central Europe. Importation into Europe gets its supply mostly from the Argentine and India, as for some years the United States has used all the seed produced within their borders and a little more. In 1909 and 1910 the flax crops in Argentine and India were much below their average. In Europe they were about normal. The United States has been using the last two or three years about 27,000,000 bushels per year, but for the years 1907, 1908 and 1909 the estimated yields after harvest amounted steadily to 25,800,000 bushels per year, but last year, 1910, the crop is estimated at not over 15,000,000 bushels. Increased demand for and lessened production of flaxseed, combined with the lessened production of other kinds of oleaginous products, brought about a natural advance in prices, and this has been intensified as regards flaxseed and linseed oil by the large and powerful seed and oil interests in the United States taking hold of the trade in a speculative way, so that prices for flaxseed during 1910 have touched the highest points ever recorded. The high prices for flax during the present year are liable to make flax growers increase their acreage and with normal weather a very large increase in production might occur, and perhaps by the time next year's crops are ready to market, prices might be 50 per cent. lower than they are at present or even less.

"The United States buyers in the last two months have bought some cargoes of Indian flax from British merchants, getting vessels on the way to Western Europe diverted across the Atlantic to New York, Philadelphia etc. They have also bought three to four million bushels of the Argentine crop. This year all our Western seed over domestic requirements is being taken by United States buyers for use in the United States, while during 1909 most, if not all, of our seed which went for export went to the United Kingdom, Belgium, France and Germany.

"The duty on flaxseed entering the United States is 25 cents per bushel of 56 pounds, but owing to a drawback on oil-cake exported, the duty does not come to over 19 cents per bushel. On this basis the price of our seed in store Fort William usually runs about 20 cents per bushel under the price of the same grade at Duluth."

Possibilities of Utilising Flax Straw.

The question of what economic use the half million tons of flax straw which Saskatchewan now produces annually might be put to is an important one. As long ago as 1896 experiments in the working of Western flax straw for its fibre were carried on by the Dominion Government through the Director of Experimental Farms. Two extracts from the report of these tests will indicate the nature of the findings:

"At the conclusion of the test the Messrs. Livingston reported that the flax grown at Nappan, Ottawa and Agassiz had produced a profitable proportion of fibre of good quality, but that the samples grown at Brandon and Indian Head had given but a small yield of fibre, which was of poor quality. Their opinion was that the fibre produced from the flax grown on these two latter farms was not sufficient to pay the cost of working."

"As the evidence obtained in 1896 as to the small quantity and poor quality of the fibre obtainable from flax grown in the North-West provinces of Canada was in harmony with the general opinion of experts who had worked with similar material in like climates in the Western States, it was regarded as conclusive and it was not thought necessary to continue the experiment further."

The matter by no means dropped at that point, however, for private parties, inventors and the like, have seen the economic possibilities in the enormous quantities of flax straw annually burned and

have persistently endeavoured to devise methods and machinery whereby linen might be manufactured from Western grown flax straw. The following extract from the report of a committee appointed by the Industrial Bureau of Winnipeg to investigate this and related industries will be of interest and may be regarded as the latest pronouncement upon this important question:

"Your committee left Winnipeg on February 6 and arrived in Duluth the following morning. In this city is located one of the most interesting factories that we visited. It is an experimental plant of the Western Linen Mills, a company formed for the purpose of working out patented processes for producing linen yarns, threads and fabrics from flax straw, but particularly straw grown in the North-West.

"James Brolin, manager of the Western Linen Mills, showed us through the plant, a factory that, with the machinery in use, has cost the men who engaged in this enterprise about \$50,000. Mr. Brolin went into the matters of material, processes and production with us very thoroughly, and gave us every opportunity to see the plant in actual operation. We were thus able to see the flax straw as it was taken from the threshing machine, treated and worked upon wholly by machinery, until it was turned out in finished products of yarn, twine and linen fabric. Stated briefly the processes of the Western Linen Mills comprise mechanical operations which take the place of the slow, tedious work that is done by hand in the flax fields and mills of the old country, and produce yarns, threads, twine and fabrics that are in great demand all over our West and which are now imported heavily from Eastern Canada, Great Britain and the United States. We saw these processes actually worked out and brought back samples of the products which are on file here for inspection. Mr. Brolin also gave us figures which enable us to report that the processes in use by the Western Linen Mills take 70 per cent. from the flax straw in the first operation, 50 per cent. of the remaining product in the second, or degunning process, and a further reduction of 40 per cent. in the third process, finally producing 108 pounds of yarn from a ton of flax straw, and has a market value of 22c per pound, or \$23.76 per each ton of straw that is put through the machines. Besides this, there are by-products of tow and mattress and paper material which are worth \$15 more, or a total of \$39.00 derived from every ton of flax straw treated. The cost of this flax straw laid down at the factory in Duluth is \$12 per ton.

"The bearing of all this upon our own agricultural and industrial life is very important. Bear in mind that the processes of the plant which we saw at Duluth take the flax straw just as it comes from the field—cut by machine, threshed by machine and in all the disorder into which it has been thrown; no pulling nor any costly hand work whatever. Half a million tons of such flax are burned every year on our Western farms. There is a splendid market at our very doors for every sort of the finished product produced. Flax experts accustomed to old country processes have declared that the Western straw from flax raised for seed is not good for spinning and that flax straw cut and threshed by machine is of no value for factory purposes. The new processes we investigated at Duluth prove that our flax straw that is now wasted in such enormous quantity is a good, merchantable product and one capable of being converted into goods for which we have an unlimited market at hand. An interesting point was that the Western Linen Mills processes have been worked out by shrewd capitalists and that no less a man than John D. Rockefeller is a stockholder in this concern, together with several New York men of high standing in the financial world.

Binder Attachments.

"At Minneapolis we called upon the Ware Binder Attachment Company. This company's product is right in line with the utilisation of flax straw because the Ware binder attachment is one that is made for the express purpose of using binder twine made from flax straw. As you are aware that all of the binder twine now used in the West is brought in from the United States and Eastern Canada and a factory in Winnipeg for producing this twine from flax straw, together with a parent plant for manufacturing a binder attachment to make the use of linen twine practicable would be a combination that must give splendid results in industrial growth and the profitable employment of what is now a sheer waste."

