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FARGO, NORTH DAKOTA

MAY 1914

CIRCULAR 1

Flax Cropping, Harvesting Methods*

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In a former bulletin (No. 103), the authors have treated the subject of flax cropping in its relation to factors involved in working the native prairie sod and in seeding. Seed selection from the bin,



Fig. 1.—Notice how stacks are made from the header. They are built from end to end at the same time,—not piled up at one end and then finished on the other. Such narrow ricks shed water well and dry out quickly.

seed grading, seed treatment and methods of seed-bed preparation were given specific attention.

This bulletin is a continuation of such discussions with reference to saving the crop. It is intended to illustrate the ways of curing and storing seed that it may be of best quality for sowing purposes, and the various steps necessary to meet the market requirements for the field crop.

To gain success in flax cropping, cutting and curing are of as much importance as seed selection, cleaning, grading, seed disinfection, seed bed preparation, or crop rotation.

* This Circular is a joint publication of the Montana and North Dakota Experiment Stations and is published simultaneously as North Dakota Experiment Station Circular No. 1 and Montana Experiment Station Circular No. 40.

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The illustrations and discussions particularly apply to conditions most characteristic of Western North Dakota and Eastern Montana.



Fig. 2.—A firm seed bed is essential in flax culture. Notice how firm the cross-section of this land is.

Importance of Good Seed.—Too much importance can not be placed upon the quality of the seed to be used on the land. The time to guarantee proper seed quality and arrange for a sufficient supply is during the growing and harvesting seasons.



Fig. 3.—A Poor Seed Bed. Such a seed bed gives uneven ripening and a poor yield.

Pure, clean, healthy seed is of even more importance than it is in the case of other small grains; for, in some respects, the flax crop is less sturdy.

The first expense of getting the new lands into crop and of adjusting themselves to new surroundings tends to cause those who break up the new lands to overlook the matter of properly caring for



Fig. 4.—This flax was drilled on breaking which was not properly rolled or packed down. Notice the air spaces. Such air spaces sometimes act as damp chambers and rot off the roots, sometimes let in the air and kill by drying.

the seed. This occasions great loss, not only in the first crop but in others which follow.

If the sowing of seed of poor quality, disease bearing, mixed varieties, intermingled with weed seeds, reacted only upon the individual farmer, the loss would be serious enough. It extends much farther. Farm pests started on one farm soon become generally distributed. The results in some sections have been deplorable. We

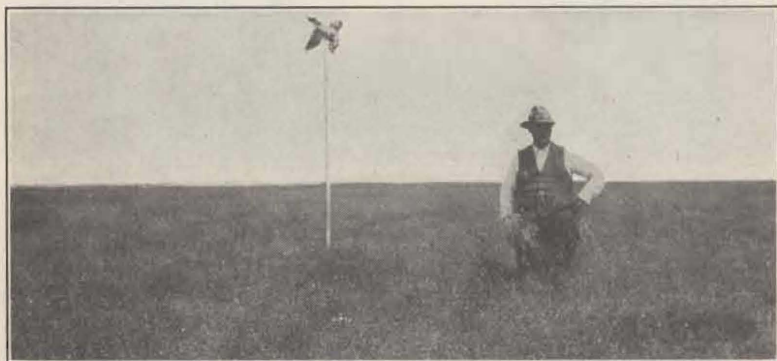


Fig. 5.—Purifying a Seed Patch. This man has staked off an area for seed purposes and is pulling out all weeds which form seeds that can not be easily removed by the fanning mill.

hope this pamphlet may aid to develop a sentiment of doing the work

on the remaining new lands and upon those now in crop in a more careful manner. Those who hold the land temporarily in large areas should, for business reasons, aid in maintaining the quality and purity of the crop and soil.

WEEDS AND DISEASES.

The Flax crop is comparatively free from pests. It is not subject to much insect or animal depredation. When properly handled it may be kept essentially free from injury by weeds and plant diseases. Certain weeds and fungus diseases which are characteristic of the crop are worthy of close attention and should be taken into consideration when preparing to select seed from the field for sowing purposes.

Weeds. Weeds may appear and become destructive at any time after the flax is up. Common yellow mustard, false flax, penny-cress or fan weed are most likely to occur. Wild buckwheat, pigeon grass, barnyard grass, pink cockle, tumbling mustard and Russian thistle are apt to be common.

Most of these weeds either have seeds which are difficult of

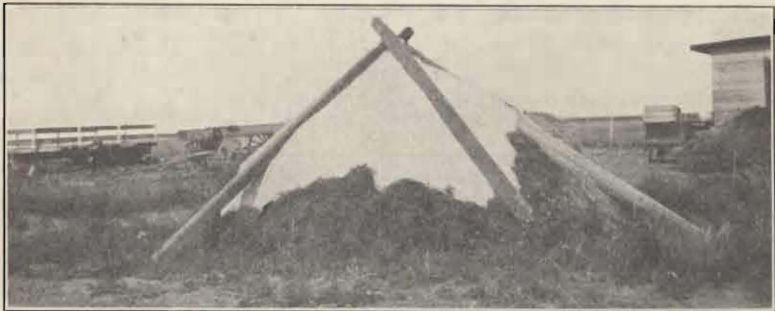


Fig. 6.—Rain spoils flax seed for sowing purposes. The straw should be dry ripe when cut, stacked at once, and covered. See how this homesteader did it.

removal by fanning mills because of peculiar weight and shape, or are especially troublesome because of their modes of distributing seeds, or because of habits of living under certain soil conditions. Many others become troublesome after flax cropping, chiefly because of carelessness in sowing seed without cleaning or grading. Such weeds as lambsquarters, red-rooted pig-weed, common white tumble weed, the pepper grasses and other small seeded plants would not get into the soil if the flax seed were given only ordinary fanning mill treat-

ment. The ones that are most world wide are those which possess odd shaped seeds which are not easily removed from flax seed by the fanning mill. They are profuse seeders and thrive in cultivated lands and a few seeds per pound of grain are sufficient to thoroughly infest the land.



Fig. 7.—In the dry land regions "brake-over" or canker disease is destructive. Seed should be selected from plots which do not show much sign of this disease. Avoid getting diseased or broken off plants into the bundles. Note how the root breaks off.

Many weeds, as mustard, produce seeds which do not of necessity germinate the first year. According to soil conditions, particularly aeration, such seeds may live many years in the soil without sprouting. This is especially true in dry, well drained lands, and is quite certain to happen if plowed under deeply.

The activities and destructiveness of weeds are more or less regional and depend upon peculiarities of habit and the conditions under which they have previously developed. For example, barnyard grass and the pigeon grasses are particularly destructive in wet, fertile lands. Those who have lands which are difficult of drainage, or those who are using irrigation methods should watch the flax seed for these and other water-loving weeds. The characteristic home of tumbling mustard, the Russian thistle and other tumble weeds is the dry-up lands or wind-blown plains. Here it is of the greatest interest to everyone to aid in holding them in check. The pod forming penny-cress or fan weed falls in this class because of its peculiar pods which break off and blow about. These and other facts emphasize the importance of special methods of handling the crop. This can be done best thru seed selection from the field.

Arrange for a proper field or seed patch inspection, and for purification by pulling the weeds before harvest. This leaves but little to be done by the fanning mill except to grade the seed to weight and uniformity or perfectness of form.

Diseases. The most destructive diseases of flax, if present, may

be and should be recognized. They are very characteristic. The grower can learn to know these as readily as one may know weeds.

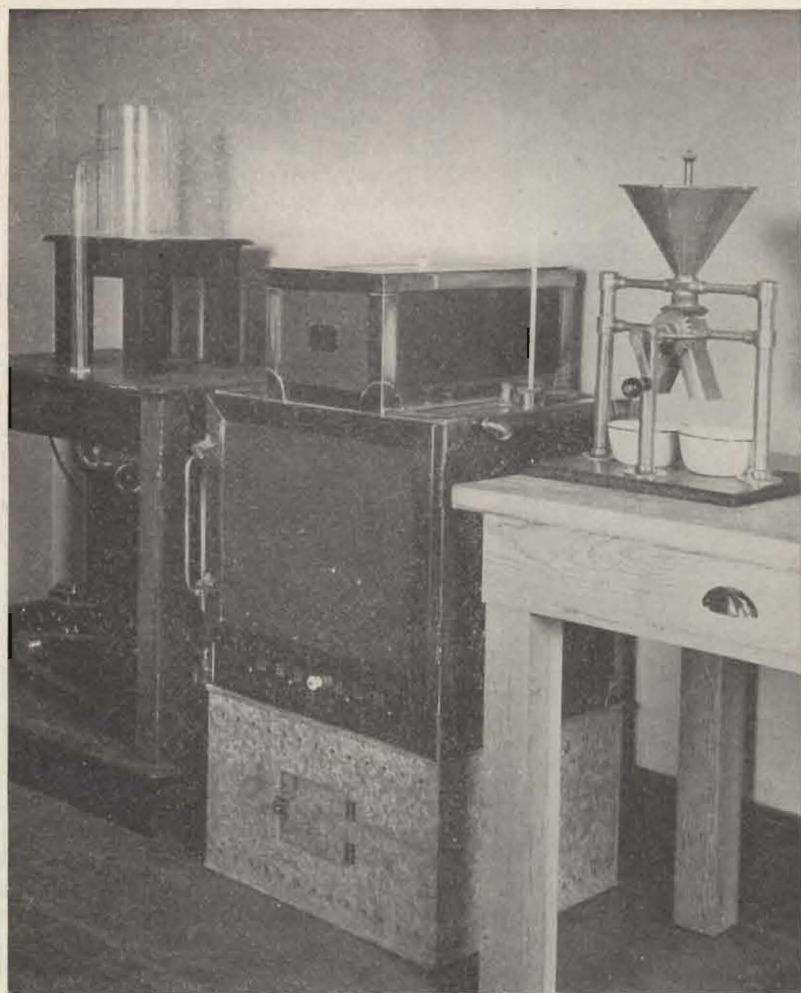


Fig. 8.—Seed Testing Apparatus—Montana Pure Seed Laboratory.

Future success with the crop depends upon how it is handled with reference to these troubles. Much of the discredit placed on this crop in the past has been due to a lack of proper knowledge regarding these fungus diseases. Methods of harvesting and saving have much

to do with escaping from the destructive effects of the diseases. Only the most destructive diseases need to be considered, for the same methods dispose of all.

Wilt and Canker. Aside from the rust which can probably be controlled by proper breeding and selection of resistant types of flax, the most destructive diseases are wilt and canker. Like weeds, the fungi are largely introduced by way of the seed. After which they are further distributed by means of wind, water and other carrying agencies. Each is more destructive in certain regions than others. Wilt is most injurious in mellow, highly organic moist soils. Canker



Fig. 9.—Testing seeds. North Dakota Pure Seed Laboratory.

does its chief work in the drier, lighter lands. Either can do much harm under any conditions of soil in which common flax can thrive. As in the case of rust and weeds, the man who grows his own seed is in best position to control the diseases.

Spores or germs of the parasitic fungi are usually dusted upon the seeds, or are located inside of shrivelled seeds. They are too small for observation. The only preventive is seed grading and seed treatment. (See North Dakota Bulletin 103 and Montana Circular 22).

Weather and Soil Conditions Influence the Ripening of Flax. Great loss is often occasioned by unequal ripening of separate flax plants. Various conditions may bring about such uneven maturing, as irregularity in planting, peculiar conditions of seasons or soil. One

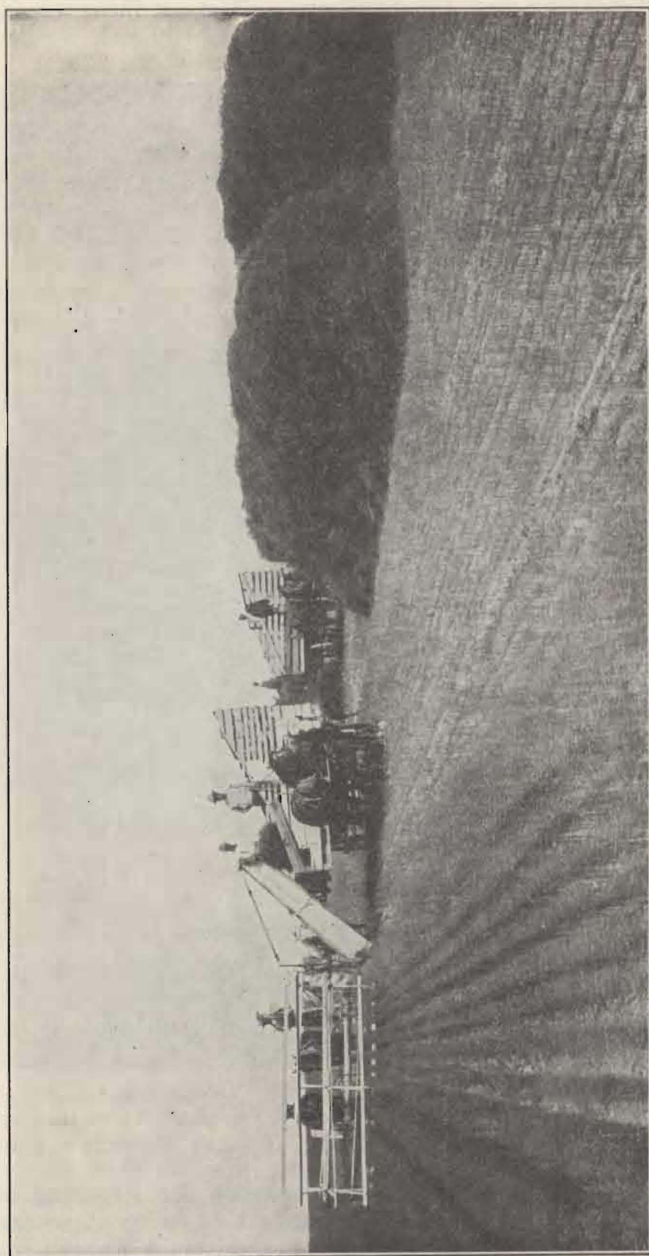


Fig. 10.—Heading and stacking short strawed flax on a large plan. This outfit averaged about forty acres a day. It is a good method for the dry land or semi-dry land farmer.

of the conditions which is most certain to produce irregular ripening is a poorly prepared seed-bed in which seeds are planted at varying depths. Some secure moisture and germinate while those closer to



Fig. 11.—Notice the number, size and location of these stacks with reference to each other. On this section the man arranged the ricks in long rows, so located as to make least hauling.

the surface fail to grow until rain falls. It is not uncommon to observe fields in which one can find plants six or eight inches in height while others are but breaking thru the surface of the ground. The quality of the seed also may bring about uneven ripening. Those that

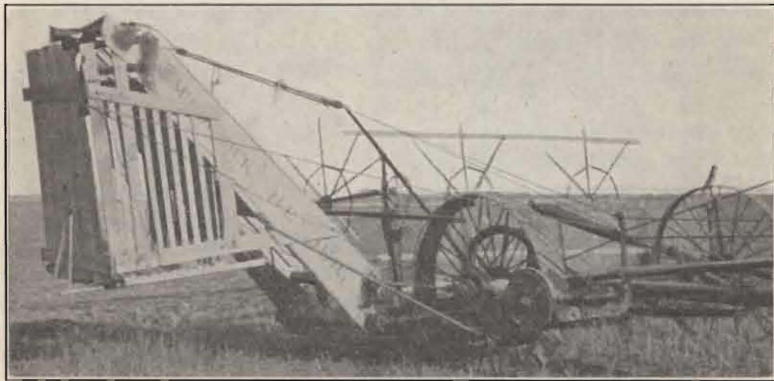


Fig. 12.—A buncher is often used on headers. They produce large, rather perfect bunches.

are weak, injured or diseased often produce feeble plants which later may commence a new growth of more sturdy nature. These ripen later than the plants from the strong seed. Cankered plants which break over while young often rebranch from a point below the injury and make a late, much-branched, uneven ripening type of plant.

The crop is likely to ripen its seed evenly when the moisture gradually disappears from the soil immediately following boll forma-

tion. By the time the crop is mature the stems are essentially air dried. If the crop does not thoroughly ripen on the straw and the lower stem portions remain green until late in summer, there is danger

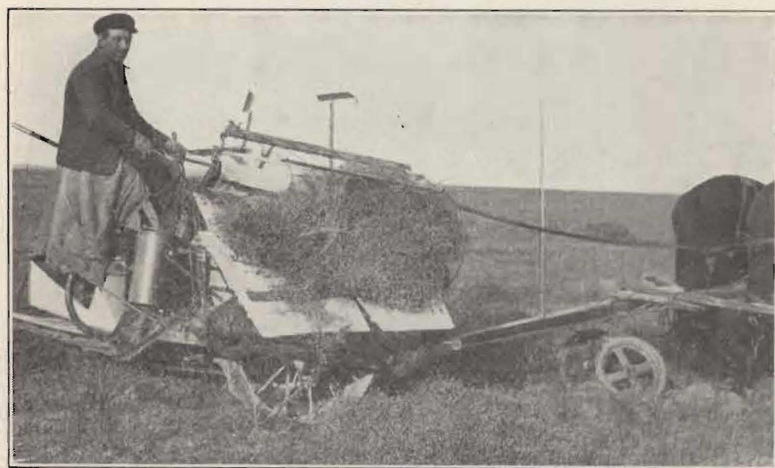


Fig. 13.—View of buncher attachment to the binder. This method of harvest is the common one in the flax growing districts. The binder mechanism is removed and the buncher takes its place.

that the greener branches will start a second growth. In such cases, the same flax plants are apt to bear ripe bolls, flowers in full bloom and half filled bolls at the same time. If rainy, cool weather sets in just at the time when the flax is nearing maturity, irregularity of ripening is usually pronounced. Those who grow flax seed under irrigation should remember these features when applying water and should aim to put on sufficient before the grain is seeded or while the crop is in its early vegetative stages to last only until the crop is sufficiently mature.

THE STATE SEED LABORATORY.

Use the Facilities Furnished by the Pure Seed Laboratory of the State. The seeds of very destructive weeds and the spores of the disease producing fungi are comparatively inconspicuous and may occur in large numbers in apparently good seed.

Fortunately in these states aid is open to any citizen. Every one who does not know the history of his flax seed or who knows that he is unfamiliar with the sorts of weed seed and characteristics of disease, should send a sample of the seed which he intends to use, or

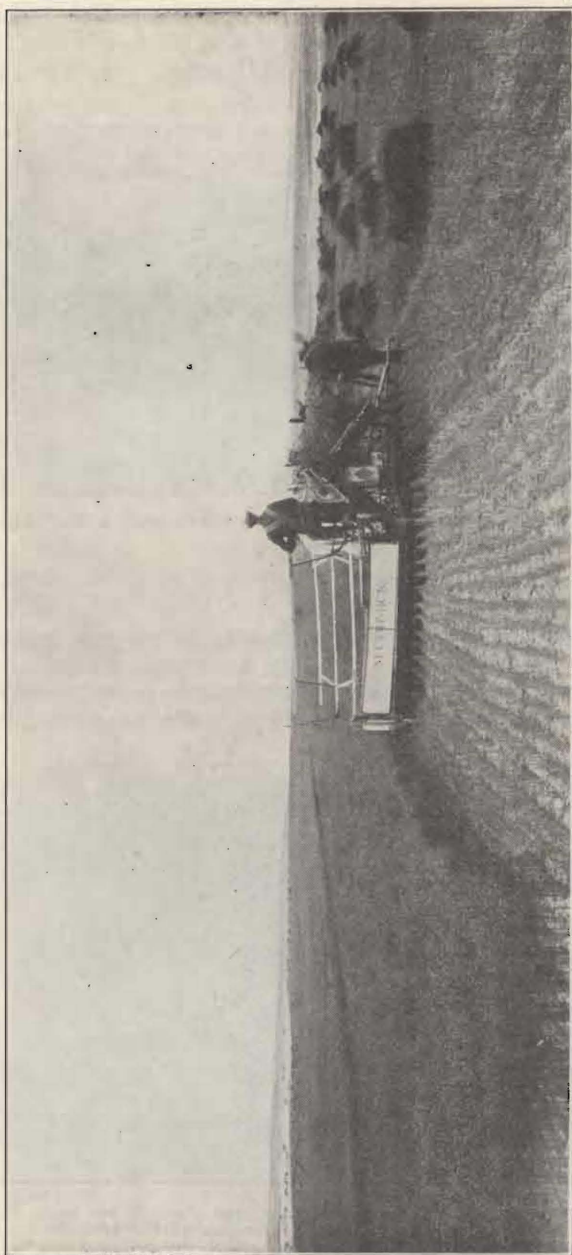


Fig. 14.—A good crop of flax on a well prepared seed bed. The binder gets the heads on such ground. The flax should not be allowed to lie in bunches until spoiled by rain.

thinks of buying, to the Pure Seed Laboratory, which is located at the Experiment Station. All such samples will be examined, analyzed and tested free of charge and a careful report made as to growth

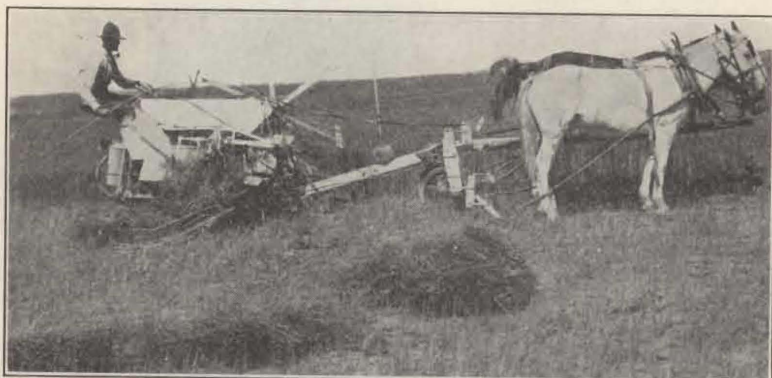


Fig. 15.—Cutting and Binding. The binding attachment is not commonly used on the short flax of the drier regions.

qualities and impurities present.

PREPARING AND HARVESTING THE SEED PATCH OR PLOT.

Start right. Every one should first secure a proper variety and quality of seed of known merit. It is best to procure a good pure type



Fig. 16.—It pays to use the binder on the seed plot, as the grain may be shocked, removing the seed bolls from the dampness of the ground.

of seed so that the purity of the soil may be maintained rather than

to get what at first may appear to be satisfactory cash returns at less cost.

Local or home grown seed is the best. One can usually find such seed by inquiring of his neighbors or by getting in touch with some members of the state or county seed growers organization or by writing to the State Experiment Station, the officers of which will



Fig. 17.—As in the case of other seed grain, if the flax cannot be stacked or threshed at once, enuf shocks may be covered to keep the seed for sowing purposes dry.

direct as to sources of supply. When once obtained, it is easy to keep up the supply from one's own farm and improve the quality from year to year.

If possible, attend the regular seed shows, county and state. See the seed exhibits. Talk with the growers. Get acquainted with the qualities and varieties of improved seed.

The Seed Patch or Seed Plot. It not only pays to grow one's own seed but pays to get some of the best seed into the hands of neighbors, so that their weed seeds and crop diseases may not blow about.



Fig. 18.—On the level fields of the west, the traction engine is sometimes used with five or six binders drawn tandem.

Select an area or patch in the field which is properly surface drained and of even growth quality. Purify the crop on this area by removing from it before harvest all weeds which produce seeds which are difficult to remove by means of the fanning mill.

Some have used the method of plugging or stopping up one or more holes in the drill when seeding so that blank rows are left. These serve as guides and one may walk thru the grain without trampling it. This, however, can be accomplished by means of lines of stakes.

A large area can be done in a short time. This patch can then

be harvested separately and threshed as soon as cut, or, when dry, may be put in a small stack. Such small stacks or stooks can be covered by hay or canvas so as to protect from rain.

The least amount of rain or moisture due to uncured straw injures flax for seed, especially if a number of cankered, flax-sick or root-diseased plants are present.

Even the threshed seed, if allowed to become damp is quickly injured for the same reason. If the heads in the bundles or bunches get wet or become moist from lying upon damp ground the fungi which produce disease rapidly spread thru the straw and become attached to the moistened seed or penetrate beneath the hulls.



Fig. 19.—Using the binder without the buncher or the binding attachment is not a desirable method.

If dampened or improperly cured grain becomes frozen or heavily frosted, such seeds are killed or are essentially worthless.

When to Cut for Seed. Early planted flax which is forced to ripen during the earlier month under hot, dry atmospheric conditions is likely to give the most evenly ripened field, and may be cut at any time after the straw begins to dry up.

In cutting for seed for sowing purposes it is especially desirable to decide upon the method, which, under the prevailing conditions, will allow the individual to save the seed in dry condition.

It is a fundamental feature of flax cropping that seed, to be of good strength and reasonably free from the diseases which are destructive to the crop must be harvested and saved dry.

In the drier regions, the straw often ripens so thoroly that no green parts remain; hence, if such grain is headed, it may be placed in a stook or small stack at once without much danger of heating.

The binder is the best machine for use on the seed plot in those regions where there is a heavy growth of straw or where there is likely to be much rainfall or moisture in the soil at harvest time. Bound grain can be stood on end so that a few days of drying wind will permit it to be threshed or thrown into rather large shocks, small or acre stooks or stacks which may be covered with hay or canvas.

As to when to cut, each grower will of necessity have to act on his own judgment, being guided by soil, atmospheric and temperature conditions.

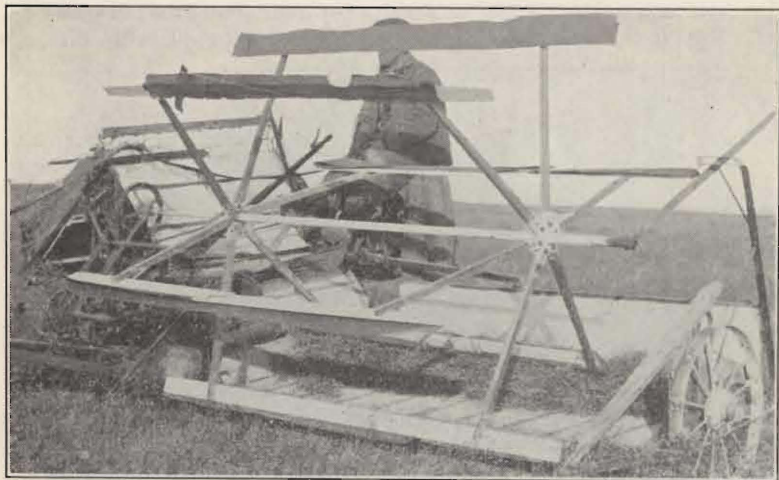


Fig. 20.—It is of advantage to attach linoleum to the reels in such manner that short flax is forced into the sickles. Some farmers have found it of advantage to double the number of slats on the reel.

Allow the bolls to thoroughly cure on the straw and the straw to air dry. Cut your seed supply from the earliest most mature flax.



Fig. 21.—Green flax, or frosted flax, often tends to gum the sickle bars. This is easily remedied by applications of kerosene or gasoline.

The crop from the seed selection patch or plot should be threshed at once before it gets wet or else should be placed at once under cover.

When threshed, store the seed in a dry place.

HARVESTING THE GENERAL CROP.

In harvesting the general field crop, all features discussed in regard to saving the seed for sowing purposes are applicable but more

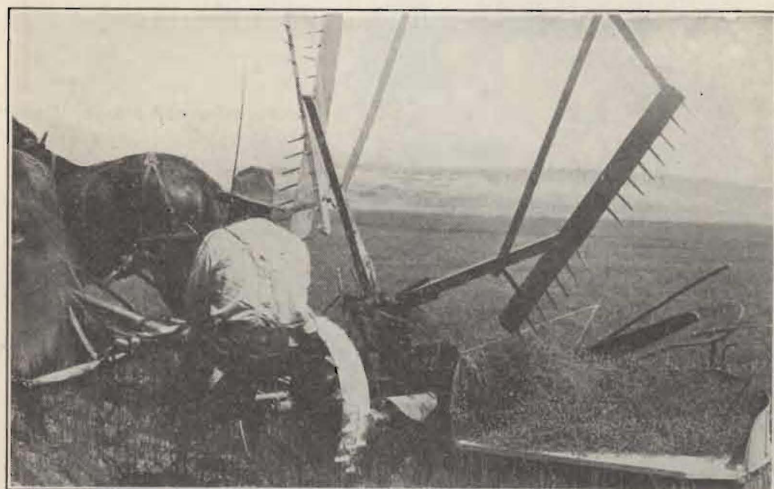


Fig. 22.—The self-rake does fair work on smooth ground. The flax must be tall and strong. The authors do not believe it desirable to buy this machine for flax harvest alone.

difficult to meet.

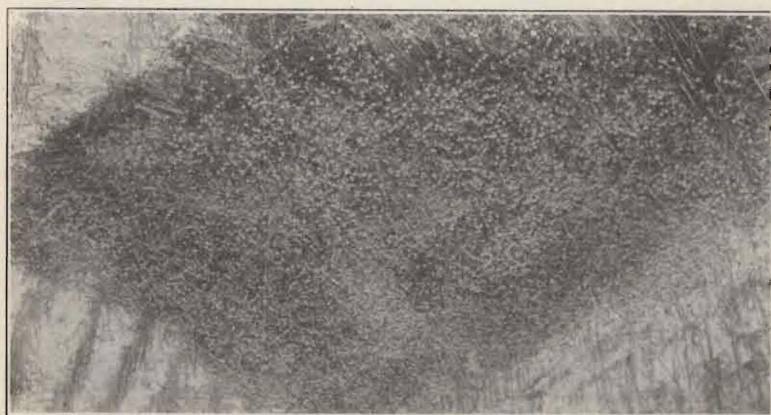


Fig. 23.—The reaper sometimes leaves the flax bundles off nicely so that the heads are all up in the air as shown above, but often when the wind blows they become a tangled mass, heads down.

There is a wide choice as to machines and methods. In no case

can the crop be satisfactorily harvested from an improperly made seed-bed. The first pre-requisite for flax harvest, therefore, begins



Fig. 24.—The first crop under rough conditions. A buncher attached to the mower is sometimes used on very short flax, but cannot do good work under such ground conditions as here shown.

before seeding. Prepare a smooth seed-bed. Such seed-bed may be secured on new or sod lands by means of a heavy roller following directly behind the breaking plow to mash the sods down evenly



Fig. 25.—Combined Header and Thresher, not commonly used on flax, it is unsatisfactory because of its disease relations and because of difficulty in regulating the speed of the thresher.

and firmly on the sub-soil. (See *North Dakota Bulletin 103* or *Montana Circular 22*.)

The commercial value of the crop can be very greatly injured by carelessness in any of the processes as cutting, curing, threshing, storing, shipping. There may be loss in yield or loss in grade. Loss

in commercial grade does not always mean less oil production but usually indicates a poorer quality of oil. Lower grades mean lower prices, often rejected seed. Frosted, bin-burned, stack-burned, mouldy or caked flax seed may be prevented thru due care in the various processes of seeding and harvesting.

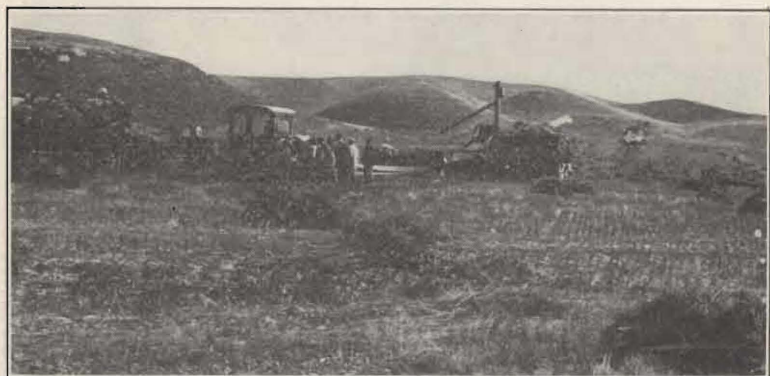


Fig. 26.—A rather typical threshing scene near the western margin of flax cropping. Trouble with the engine.

Flax seed which is threshed damp is apt to heat. Flax which has been snow-covered in the shock, in bunches, or in improperly prepared stacks, if threshed with snow or ice intermingled, is apt to spoil before it reaches the terminal market even in cool weather.



Fig. 27.—Loading from bunched flax.

Manufacturers particularly object to admixtures of green or immature seed. They claim it is difficult to get a properly clarified oil even when other qualities are reasonably good. The oil is apt to possess acid qualities which are not desirable. Grain which becomes heated, mouldy and caked before it reaches the machinery of the

terminals may be a complete loss. Often it is unfit to use even in making stock foods.

Short Irregular Flax. In dry seasons, the crop is often very short strawed and uneven. Often such crops produce a large amount of seed of good quality. When the seed-bed is rough it is difficult to

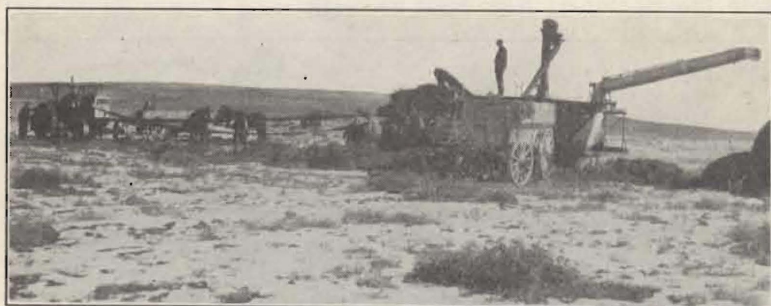


Fig. 28.—Threshing flax from bunches after snow-fall. It is not a good plan. Better sow the crop earlier.

procure this seed with any type of harvesting machinery. If the ground is firmed to an even surface, the flax can be saved. The types of machinery which should be used must vary according to the condition of the surface, weather conditions, amount to be harvested, the value of the flax, the cost of labor and the crew available to do the work. In the driest regions, farmers having large acreage and plenty of horses or traction power are usually able to use a header. There,



Fig. 29.—Flax can be stacked if thoroly mature and air dry.

it is generally believed that this is the most economic type of harvester for saving the seed. On the diversified farm, the binder, used with a bunching attachment, because of its lighter draft, is usually considered satisfactory.

Header Harvesting. The header is a very satisfactory machine. It is economically efficient for handling the commercial crop in a large way. It is particularly adapted for cutting short flax. The platform can be lowered close to the level of the ground line. The reel has eight slats upon it instead of six as in the binder. Provision is also made for increase of speed of the reel. An outfit consists of four to six head of horses, two header wagons, a capable driver for the header

and one each for the wagons. There should be a man or boy in the header box to keep the flax away from the carrier. One of the men should be a reasonably competent stacker. Such a crew and outfit, under favorable conditions, can cut from 35 to 40 acres per day. All parts may be elevated into a tight header box and then to the stack or into the machine. Few bolls or seeds need be lost.



Fig. 30.—Many people have wondered why western flax straw is not good for fiber after threshed. See what the thresher does to it.

For either stacking or threshing direct, the flax must be fully ripe. The straw should be essentially dead before it is headed, otherwise it

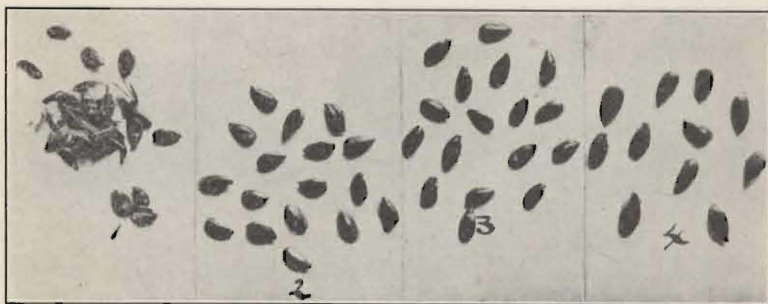


Fig. 31.—When the crop is threshed the farmer should grade the grain before selling, keep No. 1 at home for feed, use No. 4 quality for seed and sell quality Nos. 2 and 3 for oil.

may heat in the stack or the bolls may be too tough to thresh well. Some eastern Montana farmers thresh direct from the header box. Whenever the crop is dry and mature enuf, they find this most effective. The method gives a saving of both seed and labor, avoiding double handling and consequent loss by shelling. It also insures against loss due to soil moisture or rainfall on poorly made stacks.

A few have lately attached a peculiarly shaped buncher to the header elevator. This allows the headed straw to accumulate in larger bunches than is allowed by the buncher attachment of the binder. This has merits. It is useful in heading late flax, likely to be subject to rain or snow fall before threshed. The bunches are large enough to prevent loss thru tumbling by the wind. It saves work in picking up the bunches. In case of early snow-fall, it is not



Fig. 32.—Flax from one of the large western ranches on the road to the market.

uncommon to have opportunity to thresh well bunched grain after such first snow fall has melted. It is the belief of the writers that this method of using the header is worthy of trial by farmers who crop large areas.

Stacking Headed Flax. Some growers are in the habit of making long narrow ricks or stacks direct from the header box. If this



Fig. 33.—Rather typical western elevators into which the flax is dumped, showing farm teams, and cars being loaded for the Eastern market.

process is followed, or if threshing direct from the box is practiced, early seeding should be done so that the flax may ripen in hot dry weather under such conditions as produce a thoroughly matured, air-dried straw. In the western districts, under ordinary weather conditions, flax is not apt to waste by shelling from the standing grain.

Header stacks are usually made in long narrow ricks about six feet wide at the bottom and seven to eight feet in height. They should taper evenly from bottom to top. Those who have been using this method report that such stacks shed water sufficiently to protect the seed. The stacks are so narrow that they are kept reasonably wind-dried and escape heating even during quite damp autumn weather. In rainy districts we advise such stacks only for winter use. The ricks should be placed parallel in groups to allow four to be threshed at each setting. They may be of any desired length which

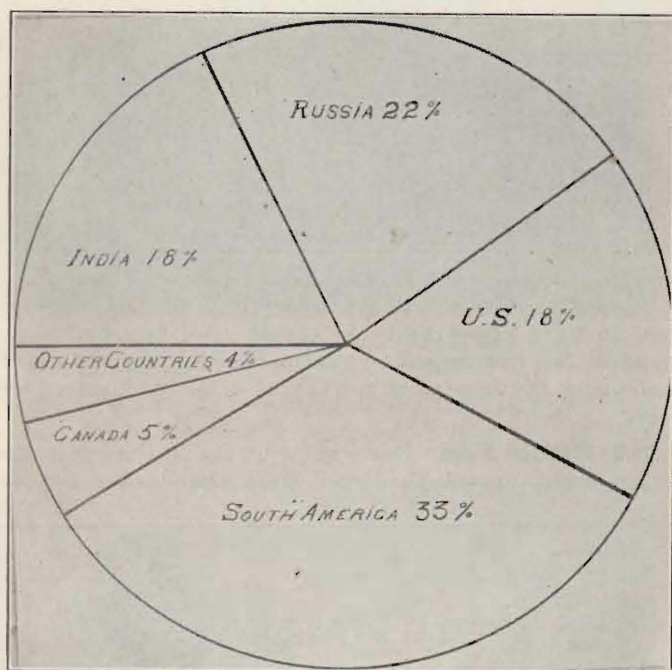


Fig. 34.—World's Production of Flax. Average of the crops of 1910 and 1911. Intelligent seed breeding, seed selection, seed treatment, and diversified farming ought to place these figures more in our favor.

can be conveniently handled. In stacking, construct the entire length from ground to top at the same time. It is not satisfactory to build one end at a time.

Headed flax or even flax from the bunchers should never be stacked in large round stacks or big ricks as for hay, wheat, barley or oats unless the straw and bolls are thoroughly air dried. Even then, a good hay top or canvas cap is essential to insure that the stack will keep.

The Use of the Binder. The binder, with binding attachment, is adapted only to fairly long straw. On a smooth seed bed, straw

from 18 to 24 inches in height can be bound in good shape. The merit in binding flax, rests in the fact that it can be shocked. The bolls rapidly dry out in the sun or wind without coming in contact with the soil. If the grain can not be threshed at once, it is of considerable advantage to cut and bind and shock in long open shocks to prevent moulding.

The binder is sometimes used without either binder or buncher attachment. The grain then passes over the elevator and is dropped off in long straight windrows. If no rain falls for three or four days, this allows the straw to rapidly air dry. We believe that the loss in

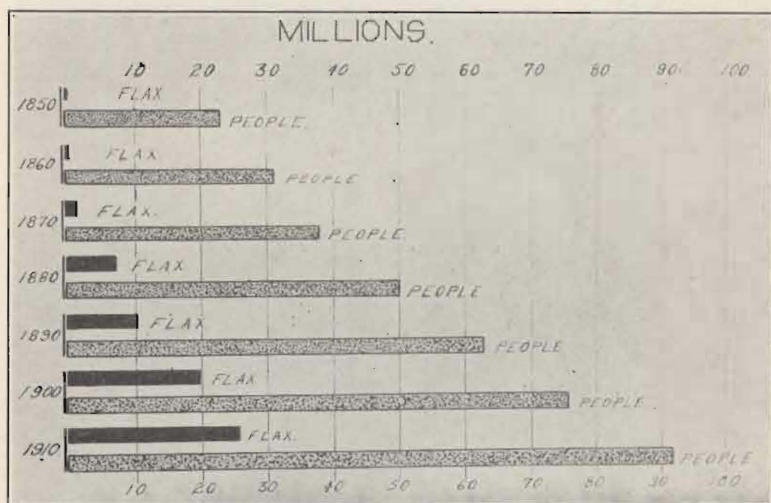


Fig. 35.—Chart showing the ratio of increase of flax seed as compared to increase in population.

picking up the grain is too great to justify the use of a binder in this way. The grain must be finally bunched by the use of the hay rake. This makes a tangled mass difficult to handle and threshes out much seed. Heavy winds also start such light windrows rollings and much of the grain is lost out or blown away.

The common method of cutting flax thruout the two states makes use of the buncher attachment on the binder. This attachment is made up of a number of rods similar to sulky rake teeth. These catch the grain as it comes from the elevator and drop it in a loose bunch. The buncher is attached to the binder after removing the binding attachment and bundle carrier.

The sickle bar, sickle guards and canvass should be kept in good condition. Loose slats on the carrier have a tendency to catch flax straw, cause blocking, and thresh or knock out large amounts of seed. The pitman should fit well so that there may be slight lost

motion. A clean stroke and sharp knife are essential. Frosted straw or straw grown in a droughty period is handled with considerable difficulty. In order to throw the flax straw into the knives, it is advantageous to attach strips of linoleum or tough roofing paper to the face of the reel slats. If properly placed, these sweep over the guards and shove the grain well into the sickle. If the straw is frosted or

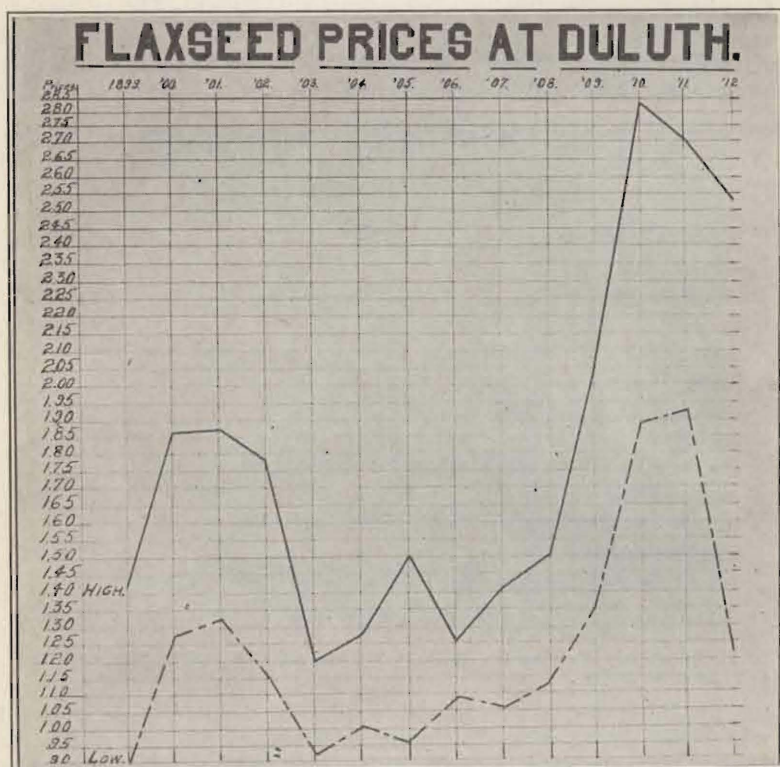


Fig. 36.—This chart shows the rise and fall in prices in flax seed by years as shown by statistics compiled by the Department of Agriculture.

green at the base, the knives often gum badly. This prevents a clean cutting stroke. To overcome this, lubricate the knives and guards freely with kerosene.

The Self Rake. The self rake or reeper is often used for cutting flax. It is doubtful if it is a paying investment to buy this type of machine for the sole purpose of reaping the flax crop. To get good results with flax, it is necessary to place it in proper relationship with other crops under diversified farming. It is, therefore, important to use the same machinery used for other small grains. The self rake

does reasonably good work on a smooth surface if the straw is long. It is not satisfactory when used upon rough ground or upon short gummy flax. The rakes fail to properly throw the heads into the sickle and much of the grain is missed or is cut off so as to fall into the stubble. In good flax, on a still day, the bunches are thrown off nicely. In windy weather, they are apt to be thrown in a tangled mass so as to fall upside down with the heads generally pressing against the soil where they will immediately begin to mould.

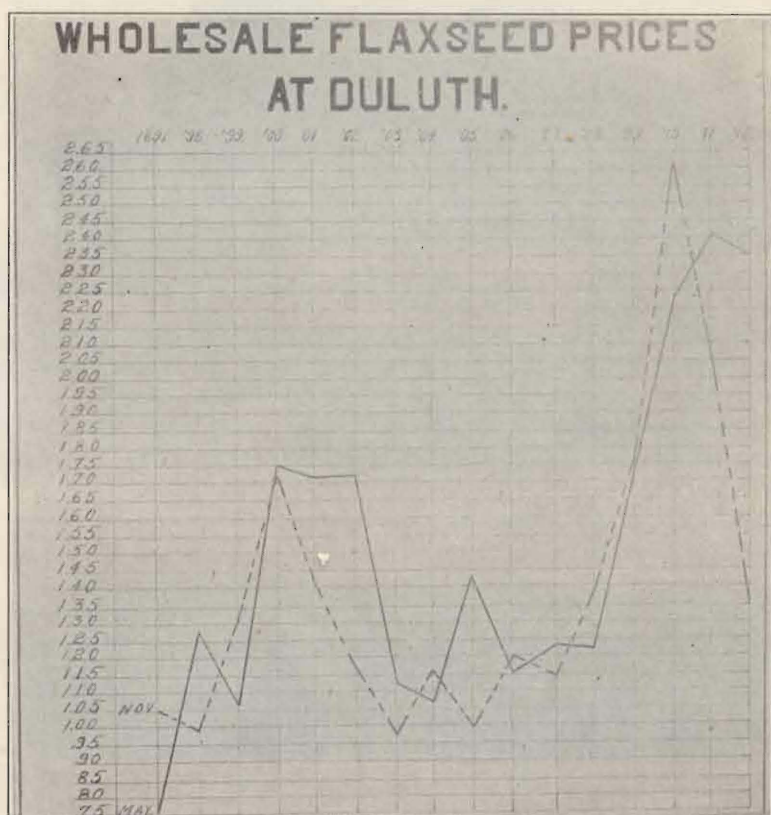


Fig. 37.—This chart shows how many times the May price was higher than the November price and how many times lower during years 1899 to 1912.

The Mower With Buncher Attachment. A bunching attachment made of slats is sometimes used on the mower. It is not satisfactory. It tends to strip off much seed and it is necessary to set the bunches over to prevent trampling by the team. The windrower attachment to mowers is also unsatisfactory. It leaves the flax scattered in long

bunches which blow badly and it is difficult to pick up the flax from such small stringy masses.

Engine Outfits. Much flax has been cut with engine outfits. An ordinary plowing engine handles from four to six binders. A man rides upon each and communicates with the driver by means of rope and gong. A number of binders are run in tandem. The last binder

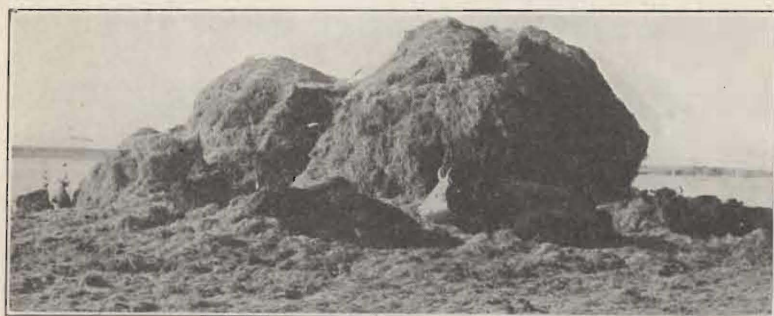


Fig. 38.—Flax straw from the threshing machine is a by-product of value. This is one man's way of using it. Many write us that it pays.

should be a wide cut machine. An eight foot cut clears a strip wide enuf for the engine. When in good working order, one can cut from seventy-five to one hundred acres per day with one tractor.

Combined Header and Thresher. The combined cutting and threshing machines widely used in the Palouse country and in California have been used with apparent success on flax. The flax straw



Fig. 39.—Sheep do well in flax stubble and in fields of frosted flax.

must be of good height and the bolls evenly and thoroughly matured, air dried on the straw. With flax the chief difficulty consists in controlling the speed of the threshing machine. In going down hill it may run too fast and blows over much seed. The combined machine is also too heavy to be used economically on wet heavy lands.

There is a more important feature connected with the use of the combined harvester and thresher. It is an even distributor of weed seeds and spores of disease, such as smut in wheat. The dust and

chaff, bits of diseased straw and minute seeds are distributed evenly over the land. Because of destructive root-infecting fungi, the first flax crop harvested in this manner will usually so infest and infect the soil that a following crop of flax is not likely to give a pay yield upon that land for a number of years.

Curing and Stacking. The most exacting feature of flax harvest consists in the proper handling of the crop from the time that the heads are mature until the seed is placed in storage. In order to control soil diseases it is essential to prevent moulding of the straw. It is very essential to have the grain become evenly ripe on the straw. We believe that this can only be assured by early planting. After the grain is mature, every effort should be made to keep the straw from becoming wet. In moist regions in which fall rains are common, flax growers find it of importance to have an open shed under which the grain can be stacked or stored until threshing time.



Fig. 40.—It is more profitable to let the hogs get out the seed and tramp down the straw for manure than to burn it. This manure should be used for top dressing pastures, and it should be used in the rotation as far as possible from the next following crop of flax, as it is apt to spread the flax diseases.

Threshing. Flax is usually considered a hard grain to thresh. This is often the case but is not particularly a fault of the crop. The trouble usually rests in the methods of handling. Dry, well cured flax does not necessarily thresh hard or give trouble. No attempt should be made to thresh damp or tough flax. The grain which comes from such damp straw can hardly be saved without considerable loss unless much care is taken to dry the seed after it is threshed. This is an expensive process.

Particular care should be directed to the speed of the separator, the work of the cylinder and the sieves. There should be no end-play in the cylinder. End-play there causes cracking or chipping of seed. The loss in dockage, due to cracking, is often ten to fifteen percent. Cracked or partially cracked seed is often greatly injured for use as seed. The separator should not be run at too high speed. There should be only enuf teeth in the concaves to knock out the seed. It is es-

essential to avoid breaking up the straw as much as possible; for, large masses of shives, leaves and chaff clog the concaves and interfere with the work of the sieves. They do not pass over the chaffer but drop thru onto the sieves. These become over-worked and much seed goes over with the chaff or is thrown into the return elevator and receives a further cracking and injury. In a twelve bar cylinder, the speed should run at approximately 980 to 1000 revolutions per minute. Most separators are now equipped with the adjustable sieve. In case this is used, a regular flax screen should be placed under it.

Storage, Handling and Shipping. If, at threshing time, the seed and straw is dry, flax is not more difficult to store or ship than other grain. If not dry, it is very difficult to handle. A small amount of dampness is sufficient to cause heating in bins or bags and when it begins to heat it quickly mats together and becomes comparatively worthless.



Fig. 41.—Plowing the flax stubble for the following crop. Usually this should be wheat, tho other cereals or forage crops do well there.

FLAX STRAW AND ITS USES.

In the early days of flax culture in the Dakotas and Montana, slight effort was taken to make use of the straw. Commonly the threshed stacks were immediately burned. This, of course, was an economic waste. However, there has been no material market for the straw and when such straw was spread upon the land, it always proved detrimental to flax growing. Now that we know that this is due to diseases introduced by the straw, this difficulty may be overcome. A number of uses for the straw are now also recognized.

Fiber. There is considerable valuable fibre even in the shortest flax straw. Present methods are such that this cannot be removed economically. However, the fibre and woody portions of the straw are now being used in a number of ways, as in insulation materials,

building paper, etc. There is also a probability that this product from the threshing machine will prove to be an important pulp material for paper making. The possible manufacturing interests which may develop about this by-product in the near future gives much promise. If the crop can be maintained as a reasonably permanent one on the average diversified farm these possible uses of the straw should give some hope to the growers of flax seed.

Feeding the Straw. There has been considerable controversy among farmers as to the feeding value of flax straw. Thoroughly ripened flax straw from the threshing machine has slight feeding value. To make that of use for feed it is possible that other steps must be taken. When, however, the straw is cut green, it is the consensus of opinion that the feeding value is high. Some who have fed large herds of stock, place it almost as high in forage value as alfalfa or clover hay. This is probably exaggerating its value but we have data which indicate that the average flax straw, when properly used, is a valuable

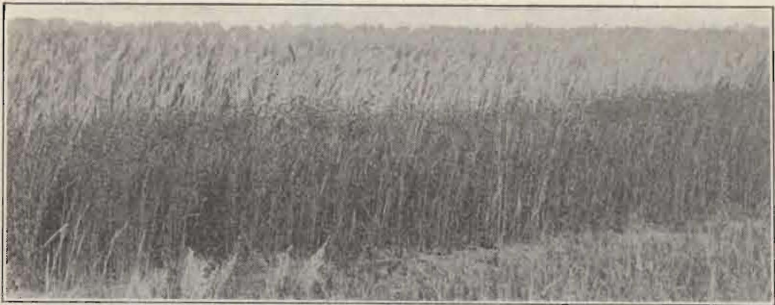


Fig. 42.—Flax sometimes volunteers in a succeeding wheat crop or vice versa. This should cause no anxiety, as these crops ripen together and can both be saved if properly threshed.

asset for feeding stock. It is important that the stock should be well salted and have free access to a good water supply and that the straw should be fed in association with other types of roughage.

There are records in which apparently the flax straw can be blamed for the loss of stock, but in all cases the injuries seem to be traceable essentially to two features: (1) Feeding a rather constant supply of very dry fibrous flax straw, unassociated with other forage, brings about stoppage due to too much indigestible fiber; or (2), The direct feeding of considerable amounts of chaffy materials or machine screenings which have come from immature improperly cured crops. Usually such injurious materials have been found to contain large amounts of green blossoms, improperly cured, more or less mouldy and heated. (As to the chemical nature of such materials see Bulletin No. 106, North Dakota Experiment Station). Proper sun drying of the green straw seems to be the chief caution which should be taken.

Many farmers have cut green flax and used it as hay without

injury when it is properly sun cured. Numerous others have turned their stock into flax stubble and unharvested flax, not only without loss but with good results. Late flax which has matured in such way that the leaves adhere to the stem is of much feed value.

Feeding Green or Frosted Flax Straw. The following is a summary of statements made by seventy farmers on feeding flax straw, particularly frosted while green, to cattle, sheep, horses and hogs. Some of the experiences cover trials of several years.

The conclusion seems to be that flax straw is a valuable forage quite nutritious and beneficial, particularly to cattle—not harmful if fed with reasonable care.

Did the cattle and horses eat it with relish? Ans: Yes, 69. No. 1. Seventeen farmers stated that the stock ate it in preference to good hay. Green frosted flax is better than dry mature straw.



Fig. 43.—In the future the American flax seed supply must come from old lands under proper crop rotation. A clean, properly worked corn ground, well smoothed and worked down in the spring, without plowing, gives the best sort of seed bed for flax.

Was it beneficial? Ans: Yes, 65. No. 2. In many cases a fine flow of milk was obtained thruout the winter. In most cases stock came thru the winter in fine, sleek, fat condition.

Many farmers mentioned that they had heard that feeding too much such material tended to cause abortion, but only one reported such a case. This was in a flock of sheep which was fed flax straw. In the spring a larger percentage than usual aborted.

Two instances were noted in which death occurred from over-eating flax screenings, which, in connection with filling up on water, caused bloating and death. Two cases were noted where horses died

from eating the straw. Autopsy showed that their stomachs were clogged with fiber masses. In one of these cases, it was found that the horse did not have water enough.

Too sudden change to a heavy diet of flax screenings or flax straw may also cause "scours" and possibly kidney trouble, which tends to make the animal very weak, particularly in the hind quarters. Two or three spoke of the trouble as somewhat similar to "staggers". This may be remedied by changing the diet back to hay or other regular feed.

Flax screenings should be carefully fed at first, about one-fourth screenings to three-fourths oats or other grain. This can be increased gradually in the amount of screenings. Screenings should not be left around stacks as cattle may over-eat, fill up on water and die of bloating.

Green flax straw should be fed sparingly at first. After the cattle get used to it there seems to be slight danger. When feeding the straw at the barn it is best to feed it only once a day, and that at the night rations, using hay for other forage feeding.

More care should be taken in feeding horses than cattle.

No cases of poisoning were noted by this group of writers.

Regardless of care in threshing and the type of straw, there is apt to be much light seed and light weight chaffy materials in every straw stack and cattle always seem to thrive when running to such stacks, providing they have sufficient feed otherwise. This is probably due to the beneficial effects of the seed.

Linseed meal, oil cake or flax seed itself, when properly handled are recognized as feeding stuffs of highest value. It is to be hoped that the time will soon come in this country when our stock men and dairy men will appreciate this feature as do the cattle men of Denmark and other dairy producing regions. The farmers of this flax producing district are working at a loss when all such material must be shipped across the ocean to find a market.

THE FUTURE OF THE CROP.

Heretofore flax has been the cash crop of the pioneer farmer and homesteader. For the last century it has been prominent on the Agricultural frontier. Its peculiar adaptability for sod land, together with its small bulk and high value well fitted it to such condition. Soon this condition must cease and the crop must find a place among the other crops upon old, well tilled lands; for all tillable virgin lands of the Northwest will be under cultivation. If history is allowed to repeat itself here, the flax seed crop will disappear, but it is certain that the Nation's need of linseed oil will continue.

Linseed oil has many uses aside from the manufacture of paint, and the demand is rapidly increasing. The present American supply

comes chiefly from Minnesota, the Dakotas and Montana. The supply can only be made continuous thru a proper handling of the remaining new lands and thru a bonifide effort by all to introduce and maintain the crop as an essential element or feature of the diversified farm.

When properly handled in proper rotation, flax can be grown successfully on old lands. Flax is a valuable crop to complete a rotation for small grains. Therefore, it should be a part of farm policy in this region to take all of the steps necessary to establish the flax crop in the new but rapidly developing system of diversified farming.

CONSERVATION OF SOIL AND CROP.

For reasons as given, steps should be taken to make it possible to continue the flax crop as a yearly crop on the average farm. This can only be accomplished by a full and careful understanding by all growers as to the proper methods of handling the crop, the seed and the soil. The crop cannot be maintained on a pay basis on any farm or in any district unless the yield can be increased. This cannot be done if we allow the soil thruout large districts to become infested with the weeds and diseases which attack the crop. This calls for careful crop rotation, seed breeding, and use of such crops as do not bear each others' diseases, associated with proper tillage of the soil to keep it free from weeds and fungi and make it possible to have seed of such strength that it can be disinfected without injury.

All of these processes must be carried out together to get lasting results, therefor such information must be received and understood by many. Infectious diseases and wind-blown weeds cannot be controlled by the action of a few men working separately upon scattered areas.

In the past the outlook for making flax a permanent crop in our ordinary agricultural system has been dark. It is the hope of the writers that this bulletin, associated with the one which has preceded, will help many to understand some of the more important features of flax cropping.

Agricultural College, N. D., May 1914.