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LINEN FLAX in
WESTERN AUSTRALIA

By H. G. ELLIOTT, Assistant Superintendent of Dairying*

FLAX as an economic crop has a fairly brief history in Australia and a much shorter one in Western Australia. The earliest records show that it was first grown near Geelong in Victoria in 1863 and in South Australia at Hydock in 1870. Early attempts to grow flax economically were not very successful and it was not until 1935 that any major progress was made. Flax Fibres Pty. Ltd., established a small flax-growing industry in Victoria but the outbreak of World War II necessitated a much more rapid expansion in Australia than was ever anticipated and the Commonwealth Flax Production Committee took over all growing and processing in Australia.

In Western Australia, linseed flax was first grown in 1905 at the Narrogin and Brunswick State Farms. Further experiments were tried in 1918 but were not very successful as only one variety, "Blue Riga" was tested. In 1939 the first major experiment with linen flax was carried out at the Research Station, Denmark, with a number of varieties obtained from the C.S.I.R.O., Canberra. Liral Crown, which at that time was the main variety grown by Flax Fibres Pty. Ltd., in Victoria, yielded well, giving good straw length and fibre quality.

With the outbreak of World War II, flax-growing in Australia for the production of fibre became essential to assist in supplying the forces' needs in the United Kingdom and Australia. Russia was the main source of supply of flax for the United Kingdom prior to the war, and at the outbreak of war the United Kingdom became dependent for her supplies of flax on Belgium, Holland, France and Northern Ireland. With the overruning of Western Europe by Germany the supply position became serious and the United Kingdom asked Australia, New Zealand and Canada to grow flax and shipped the initial seed to these countries. This seed mainly consisted of the white-flowering variety "Concurrent" which was obtained from Western Europe just prior to the German occupation.

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Western Australia was asked to cooperate in this effort to produce flax and in 1940 the Australian acreage went to 20,692, of which 980 were planted in this State. Today, Western Australia is the only State in Australia growing flax, with the processing being done by a privately-owned concern, the Blackwood Flax Co-operative Co. Ltd., at Boyup Brook.

During the early part of World War II an endeavour was made in this State to establish linseed as a commercial crop with the variety “Punjab” but the attempt failed, as this variety was severely affected with rust and also attacked by climbing cutworms. Further attempts have since been made to establish the linseed industry using the rust-resistant variety, Walsh. Some success has been achieved in recent years in the medium rainfall areas of the middle and lower Great Southern and South Coast.

The fibre flax plantings in 1940 were late-sown (July-August) in the coastal areas between Waroona and Dardanup and although most crops were attacked by climbing cutworms encouraging results were obtained and some 600 tons of straw were supplied to the mill at Yarloop.

As it was necessary to increase the acreage in Australia in 1941 further areas were explored and two new centres were established at Donnybrook and Boyup Brook. Some 6,200 acres were sown in the three districts. All three mills were then dew-retting straw. By 1942, 8,730 acres were planted, this being the maximum area planted in any one year in this State.

In 1944 the Yarloop Mill was closed and in 1947 the Beelerup Mill near Donnybrook ceased to function, leaving the Boyup Brook Mill as the only one operating in this State.

During the period 1940-45 all straw produced in this State was dew-retted and on an average about 6 per cent. fibre on original weight was obtained. This method was wasteful due to inability of controlling weather conditions. Apart from that, it was much more costly in manpower than the present system of controlled hot water retting in concrete pits.

In 1945 a battery of eight pits for controlled hot water retting was installed at Boyup Brook and much higher yields—up to 9.5 per cent. of line fibre—was obtained by this method.

The Flax Production Committee of the Commonwealth Government decided in 1949 to offer for sale all its mills and depots in Victoria, South Australia and Western Australia—the three flax-growing States at that time. The only mill sold by them was the one in this State. It was purchased by the W. A. Government for the Blackwood Flax Co-operative Co. Ltd., Boyup Brook.

During 1943 there were 34 flax mills and depots operating in Australia as follows—Victoria 18, South Australia 4, Western Australia 3, and Tasmania 9.

The setting up of the Flax Commission in place of the Flax Production Committee took place in 1950 and this body controlled the growing and processing of flax in Victoria (7 mills) and South Australia (1 mill) until the growing in these States ceased in 1958. It is now anticipated that all mills under the Commission’s control will finish processing before the end of 1959 when the Commission will then cease to function.

DESCRIPTION

Flax is the fibre produced from the flax plant (Linum usitatissimum) which is a slender annual growing to a height of 1 ft. to 4½ ft. with blue-purple or white flowers. It is a vegetable fibre of bast classification being one of the most valuable and useful vegetable fibres produced in the world, as it is superior in strength and quality to cotton, and will produce a finer fabric.

Owing to the fibre having great tensile strength and durability it is used in the manufacture of such commodities as heavy sail-cloths, canvas, twines and threads, nets, finest writing and cigarette papers and insulating fabrics. During the war it had many uses in the three services. Apart from the fibre produced by the plant, surplus seed is of value for the production of linseed oil and meal for stock feed.

The original flax plants were grown for both seed and fibre but from this, over many years, two main types have been segregated, one for its height and fibre, and the other for linseed only.
THE FIBRE

As mentioned earlier, flax is a bast fibre produced as an intermediary layer between the outer cover or bark and the inner stem of the plant stalk. This layer is held by a gummy substance which makes extraction difficult. It is the breaking down of these gums or pectins by retting or rotting which frees the fibre from the woody material of the stalk so that the beaters of the scutching turbine can separate them.

HISTORY OF FLAX-GROWING

Flax goes further back in history than any other present-day commercial fibre. The earliest cultivated flax was one known as *Linum angustifolium*, which was a much smaller plant with fewer and narrower leaves than the present day flax plant, and was also a perennial.

This variety was known to have been cultivated for fibre and manufactured into various articles by the Swiss lake-dwellers in the Stone Age period. This variety still occurs, growing in its wild state, in many parts of south and west Europe and south-west Albania and Asia.

The Egyptians grew, and used flax, thousands of years ago and the Babylonians carried this use on to a fairly high state of textile development. Three thousand years ago the Phoenicians extended the culture, and the Greeks, together with the Romans, made it into a household industry.

During this period the variety used was *Linum usitatissimum*, the variety which is now grown commercially throughout many parts of the world. It is still found growing wild in the districts between the Persian Gulf and the Caspian and Black Seas. The early use of flax fibre was for the making of lines and nets for fishing as well as catching wild animals, also for the woven fabrics worn by many peoples of the ancient civilisation. It was used for such purposes as tapestries and the wraps for embalming bodies, as linen was found in the tombs of many of the ancient Egyptians.

At the present time flax is grown in nearly every portion of the temperate zones of the world, and the most important areas where it is cultivated are in the Baltic countries of north-west Europe,
and also in Denmark, Holland, Belgium, France, England and Ireland, as well as in Canada, the United States of America, Mexico, Japan, Australia and New Zealand. Some is grown in Kenya and in portions of South America, and very good flax has been and still is being grown near Archangel in Russia.

PRODUCTION OF FLAX

Before World War II the Soviet Union produced over two-thirds of the world's crop, the bulk of which was consumed in Russia for home production of linen articles. The rest was grown throughout Poland, Germany, Belgium, France, Holland and Latvia. Practically none was grown in any other parts of the world except a little in Ireland and England.

Practically all the flax used in pre-war Britain was imported. In the early 1930's the Soviet Union was the largest exporter of flax but this export rapidly dropped during the latter part of 1930. During that time Belgium, Holland and France became the main suppliers to Britain.

Most of the Dutch and French flax was prepared in Belgium, prior to export, as the latter country had developed far more favourable conditions for the treatment of flax by improved methods.

During the earlier parts of the War when these countries were overrun by Germany, supplies had to be produced by other countries throughout the world and it was then that the Australian Government was asked to assist in this production.

FLAX-GROWING

Climate.

It is generally recognised that the most suitable conditions for the growing of flax are a cool climate, having sufficient moisture during the growing period with a relatively long ripening period between flowering and harvesting. Any form of excessive water-logging during the winter months will have detrimental effects on the growth of this crop but late spring rains together with winds can also have a bad effect when heavy crops can be lodged and tangled.

The incidence of heavy storms, and hail are particularly dangerous during the latter period of growing but it is generally considered that the climatic conditions in the south of this State are suitable for the growing of flax.

Soil.

Profitable crops have been grown in this State on a variety of soil types, but it is generally recognised that the best soil for high-yielding crops is a well-drained loamy soil which overlies a clay subsoil. Very high-fertility soils are not necessary for the production of good linen flax crops, as these tend to create a quick-
growing, tall, rank crop which frequently tends to lodge. The straws from such crops can be coarse and of low fibre yield.

Poor low-fertility soils are unsuitable, since the crops grown on them have a tendency to be too short, low-yielding and uneconomical to harvest. It is recommended that flax can be grown as a rotation crop to pasture and cereals. On old pasture land, however, it is suggested for best yields that a cereal crop be grown the year prior to planting the flax crop.

It is not good practice to sow flax on the same land for more than two years in succession as there is a tendency for a build-up of rust and other diseases to occur. On a heavy loam with very high fertility, three excellent crops have been produced in succession in the Boyup Brook area, but nitrogen, potash, zinc and phosphorus can be the limiting factors for good growth.

Diseases such as are experienced elsewhere which cause "flax sickness" in the ground are not known to exist in this State. The fungus disease *Fusarium lini* which causes what is known as "flax wilt," has not been recorded here.

**Soil Preparation.**

To obtain the best results a good soil preparation is essential. Prior scarification and then the ploughing of the land with a mouldboard plough are recommended, and the area should then be left in a short fallow for a period of about two weeks, after which it should be cultivated down without turning up the ploughed-over sod.

Compacting and harrowing a number of times is essential to obtain the fine smooth seed bed required for the best results and germination. Control of weeds by good cultivation prior to planting is essential, and this also gives control of such pests as lucerne flea and red mite. Where land has a tendency to be cloddy, slugs can cause a considerable amount of damage during the winter months.

Every care must be taken to select well-drained land for flax growing; waterlogged soils are detrimental and frequently heavy growth of water weeds will occur.

**Time of Planting.**

Once the land has been well prepared and is ready to receive the seed, the best time to plant is from mid to the end of May under most seasonal conditions. If heavy early June rains do not occur, seeding can frequently be carried out into mid-June particularly on soils which are fairly rich in nitrogen. It is not generally recommended to plant very early as frequently insufficient preparation of the soil to control weeds and pests takes place.
Apart from that, early sown crops on most soils have a tendency to become too tall and liable to lodge.

Method of Planting.

The standard method has been to drill in the seed with the fertiliser using a grain drill. Cross-drilling is sometimes carried out, but recent experimental work indicates that best yields and results are obtained by semibroadcasting the seed. This is done by pulling the hoses out of the shoes of the drill and dropping the seed and fertiliser behind, using light drill harrows to cover the seed.

Rate of Seeding.

The standard recommendation is at the rate of 72 lb. per acre. This can be varied slightly with the varieties and with the variety "Wada" lower rates are recommended. Experimental work carried out over the last few years indicates that slightly higher rates up to 90 lb. per acre with some varieties may be an advantage when semibroadcasting is practised. Care should be taken to see that the seed is not planted too deep—¼ in. to ½ in. is ample.

VARIETIES

For many years in this State, Concurrent has been the major variety grown. Many other varieties have been tried but rust has been one of the limiting factors for the growth and yield of these. A number of new varieties have been produced which have been resistant to races of rust occurring then, in this State, but new races of rust have occurred and attacked many of these varieties. At present the popular varieties are Concurrent, Wada, Boyup and Currong all of which are susceptible to one or more races of rust, but generally not severely enough to cause extreme damage to the crop every year. A new unnamed rust-resistant variety D83, Selection 2112, bred in this State (as were Wada and Boyup), is now being bulked up for seed, to sow larger areas and to determine its fibre recovery and value.

FERTILISER

From 1 to 1½ cwts. of super-zinc fertiliser is recommended to be sown at time of seeding. Under light sandy soil conditions and where potash is known to be a deficiency 1 cwt. of muriate of potash is recommended. On practically all soils where flax is grown in Western Australia, nitrogenous fertilisers are not required as generally flax crops are grown in rotation with oats or clover. Frequently, on the better soil types which have been under clover pasture for a number of years, it is better to grow a crop of oats first, as if sown to flax excessive growth takes place which gives a tall crop, liable to be coarse-stemmed and subject to lodging badly with unsuitable weather conditions during the late spring.

PESTS

Red-legged earth mites and slugs are the two main pests responsible for reduced yields of straw in this State. Lucerne fleas can also cause damage, and climbing cutworms have been responsible for heavy losses in crops after flowering time by causing not only the lowering of yields but loss of seed and damaged straw.

Red Legged Earth Mite. (Halotydeus destructor.)

Before control measures with insecticides were available control was by clean farming and a short fallow period. Today sprays or dusts containing DDT and Malathion or similar substances are used prior to or after seeding with excellent control results. It was estimated that prior to insecticide control up to 10 per cent. loss of seedlings occurred annually, and hundreds of acres were completely lost yearly apart from the general thinning out of crops.

Slugs.

These generally only affect crops on heavy soils left cloddy. Baiting with a methaldyhyde or similar preparation is recommended for their control.

Lucerne Flea.

These do not generally cause much damage but where present on late-sown crops they can be controlled by using one of the sprays containing Parathion or Malathion or a similar compound.

Climbing Cutworm. (Heliothis armigera.)

During the early war years climbing cutworms caused considerable damage. Many crops were totally deseeded and in
some cases the straw was badly damaged with the result that poor quality short fibre was obtained. Control measures by using 2 per cent. DDT dust brought about a change in this trouble and whenever an outbreak is suspected control measures can be adopted by using sprays or dusts containing DDT.

**DISEASES**

**Rust.**

This is the most important disease of the flax plant in Western Australia. It was first recorded on cultivated flax in South Australia in 1889 and during World War II it was one of the contributing factors towards the abandonment of flax production in Tasmania. Both leaf and stem rust occur in this State. Where heavy infection of the leaves takes place without much damage to the stem, serious reduction in yields of seed and premature ripening of the straw will occur. Where the stems are badly affected, a serious reduction in the yield and quality of flax fibre occurs.

This disease has been known to cause complete failure of crops in all stages in this State and the earliest stage in which crop failures have occurred is when the plants were in the vicinity of 9 in. high. Less severe infections later in the season can reduce yields by about 25 per cent. The spores or seeds of rust are the reproducing bodies of the fungus and are mainly wind-borne. Rust is a disease which is very difficult to control and the only satisfactory method of attack to date has been by endeavouring to breed new varieties of flax which are highly resistant to this disease.

Unfortunately a number of rust races of flax occur in Australia and it would appear that new races of this fungus are produced from time to time. In an endeavour to overcome this rust trouble in flax in 1946, Dr. A. J. Millington, then Plant Geneticist of the Department of Agriculture, selected a number of plants from a paddock which was severely affected by rust in the Donnybrook area. The seed of this was subsequently bred up and finally a new variety produced which was named Wada.

As far as can be determined the basis of this new variety was Riga Crown, which first originated in the Baltic States. Subsequently, this variety, Wada, was
found to be affected by another race of rust. Later another rust-resistant variety was bred by the Department of Agriculture in Western Australia and this was called Boyup. Boyup had a much better fibre quality with a more erect growing habit, and was less liable to lodging than Wada. Later, unfortunately, this variety was attacked by a further race of rust. Today, these two varieties together with Concurrent and a Victorian variety Currong, form the basis of the varieties which are grown commercially in this State.

Zinc Deficiency.
This was first identified in Western Australia in Murradup in 1942 and Donnybrook in 1943. Control measures were quickly found from work which had been carried out in South Australia, and zinc applications with superphosphate were recommended to overcome this disease. Generally, the disease was more serious on the lighter sandy soils but many of the heavier soils throughout the flax growing districts in the State at that time were affected. The disease was commonly known as “die-back.”

If zinc oxide at the rate of 2 to 3 lb. per acre is not used now when planting this crop, reductions in yields and quality of straw can be from 10 to 100 per cent. according to the severity of the deficiency in the area.

Calcium Deficiency.
This has occurred in odd areas throughout the flax-growing districts but not in sufficient size to warrant control measures being taken. From 1 to 2 tons of lime applied to the soil at the time of planting controls this disease.

Flax Wilt.
Throughout most of the flax-growing portions of the world this is a very serious disease as when infected, plants wilt and die at any stage of growth. Generally it can be said that the most dangerous aspect of this disease is that it is seed-borne and once in the soil will remain there for many years. Up to date, this disease has not occurred in this State as every precaution has been taken to prevent its entry.

Stem Breaking or Browning.
This is a fungus disease which attacks the plants through the cotyledon. When severe it can cause the collapse of the stem close to the soil level. It also causes a blight on the leaves, stems and buds which appears shortly before harvesting. This stage of the disease is called brown rot. Where it does occur, it substantially lowers the quality and quantity of fibre.
as well as the seed yield. To date the disease has not occurred on the commercial crops in this State.

WEEDS

The most serious weeds in flax are the tall growing species such as thistles, wild radish, wild turnip, and wild oats as it is difficult to remove these from the sheaves during the processing of the straw for fibre. Good cultivation prior to sowing is essential to reduce and control weeds. Short-growing butt weeds can frequently be removed from the sheaves during deseeding operations but where crops are pulled, these are generally left in the field as the pullers operate above the line where the butt weeds occur.

In the earlier stages a heavy incidence of weeds in a flax crop is very serious as flax is slow-growing and consequently not a good competitor.

Many methods have been tried for controlling weeds in flax crops and some success has been obtained with growth-prohibiting types of weedicides. If these are applied when the flax crop is around 4 in. to 8 in. high, the waxiness of the leaves and stems of flax at this stage, prevents absorption of weedicides and the crop is not so susceptible to damage.

Where heavy weeds occur not only in the butt but throughout the sheaves, much greater costs occur at the mill in processing and consequently the producer receives less per ton for his straw.

TIME OF HARVESTING

It must be recognised that when the flax crop is grown for fibre it should be harvested before it has reached full maturity. The time to harvest is when the crop is at the stage when the first bolls in the centre of the plant are brown with some seed rattle and approximately three-quarters of the leaves on the stem have fallen and the stems are still sappy. The stems at this stage should be of a golden yellow colour. The time for harvesting in this State is that period between the end of November and late December. This can vary according to the district, season and the varieties grown.

METHOD OF HARVESTING

In practically all countries throughout the world harvesting of the fibre flax crops is carried out by pulling, either by machine or in some parts by hand. During the earlier periods of the history of flax in this State the binder was used for harvesting. This was in a similar manner to that of harvesting oaten or wheaten hay and this practice was adopted as a standard one for many years, as most of the farmers in the flax growing areas had reaper binder machines of this type and as it was only necessary for the farmers
mechanism removes the seed bolls from to make minor adjustments to the machine to enable them to switch over from hay cutting to flax cutting. In the last three years in this State an alteration in the method of harvesting has taken place as a number of the most modern European flax-pulling machines have been imported by the co-operative company and it is anticipated before long that the bulk of the crops will be harvested by machines of this type.

These machines pull and bind the crop ready for stooking and are capable of operating at speeds of up to eight miles per hour and pulling up to two acres per hour under ideal conditions.

Heavier yields per acre are obtained by the farmers with pulled crops and the mill obtains crops which are reasonably free from butt weeds. Apart from this, previously many of the crops which were too short for cutting are now harvested, as when pulled they make sufficient length for economical processing at the mill.

Crops under 24 in. in length cannot be handled economically by the flax mill and crops which exceed 40 in. in length are not generally considered economic as they yield fibres which are too long for easy handling by the spinners.

STOOKING

The normal method for stooking for hay is generally adopted with flax. However, it is recommended that long stooks should be made, not large round ones, as better curing will take place.

It is essential that when handling a flax crop every care is taken not to damage, or create tangling or loss of straw during these operations.

The better the crop is handled in the field and during cartage the greater will be the recovery of fibre at the mill.

CARTAGE

Flax cartage is carried out by contractors with motor trucks or farmers with their own trucks. Here again it is essential that every care be taken with the straw during the handling and carting operations. The straw, on delivery at the mill is weighed, and the farmer is then paid according to the assessment, which has been made in the paddock prior to him being advised that cartage to the mill be proceeded with.

PROCESSING

In Western Australia, the farmer is responsible for the growing, harvesting and cartage of the flax crop to the mill. Frequently the flax processing company provides pullers or binders at contract rates and arranges contract cartage to assist harvesting and delivery operations.

Once the flax straw is valued in the field, carted to and weighed at the mill, it then becomes the property of the company. It then may go immediately into stack, or to the deseeding plant for processing and when deseeded go either to stack or the pits for retting, after which it is then gaited for drying, finally stacked or carted to the scutching machine, this all according to what seasonal operations are taking place at the time.

Cartage from the farms can only take place during fine weather and when the straw is efficiently cured so that stacking or deseeding can take place immediately it is received at the mill.

STACKING

Undeseeded straw which is to be processed before the winter is stacked in the open according to farmer crops and straw quality, so that the identity of it is not lost at the mill. Original straw which is to be held over to the following spring before processing is stored under the cover of large sheds capable of holding over 2,000 tons.

DESEEDING AND WINNOWING

As the new season straw arrives at the mill, that which can be handled through the deseeders is processed and then either stacked ready for future treatment or immediately retted. The amount handled per day is limited to the throughput of the deseeding machines which at present can handle up to 85 tons per day. Soenens types of machines which can be either stationary or mobile are used at present for this purpose until the new mobile deseeders is installed. The sheaf bands are cut and the straw then fed into the deseeding machines uniformly. Combing
the straw and on cut straw removes the butt weeds and short straws from the butt end. The straw is then mechanically re-butted and tied with twine again. Short straws and weeds are baled for packing material and the seed and bolls passed on to the scalper and then to the winnowing machines for crushing the bolls and separating the seed from the boll chaff.

The boll chaff, together with immature seed, is then passed on to a hammer mill where it is hammered into a pollard. This is readily sold as a basis for stock feed as it contains about 10 per cent protein but is rather high in fibre and fat.

The bulk seed obtained is then passed on to cleaning machines which separate out a number of seed lines ranging from first grade sowing seed to commercial seed which is then sold for linseed oil extraction and the production of linseed meal. Weed seeds are hammermilled into a meal and find a ready market as a basis of stock foods.

RETTING

This is a process of rotting, of which there are many methods in use in various parts of the world. The process can be carried out by what is known as “dew” retting or hot or cold water methods, and even by chemical means. However, at Boyup Brook a system of controlled hot water retting is adopted.

To understand the process of retting it may be wise to describe the structure of the straw.

It consists of—

1. The skin which is an outer layer of cells.
2. A ring of fibre cells or bundles which are held together by pectins which are gummy substances.
3. A central cylinder of woody material which is ultimately known as shive when beaten from the fibre by the scutcher.

Retting can be by either bacterial or fungal action and in water retting it is by bacteria which is normally present on the straw. With the controlled hot water system the process takes from 96 to 110 hours for the pectins and gums to be broken down sufficiently. Once this action has taken place the straw is then taken out, gaited and dried, ready for scutching.

At the mill there is a battery of eight tanks each capable of holding up to 10 tons of dry straw. These were installed in 1944.

Once filled, the tank of straw is first given a rinse for seven to eight hours with water at a temperature of 73° to 75° F. This rinse removes much of the highly soluble materials from the straw. These materials could retard the retting process if not taken off first. The second or retting water is then pumped in at a temperature of 85° to 86° F. and during
the retting period the temperature is gradually increased by about 4° F. every 12 hours until 95° F. is obtained. When retting is completed the tank is drained and straw left in it for three to four hours before taking it out to the paddocks for gaiting and drying. It takes about 30,000 gallons of water to ret each tank of 10 tons of straw. For best results, good quality water is essential.

SCUTCHING

This is a process whereby the shive or woody material is separated from the fibre in the retted straw.

A modern scutcher has a prefeeder and a series of fluted breaker rollers with two turbines for beating the woody material from the fibre. It is necessary in this process to see that the straws are parallel and well butted, prior to entering the breakers of the machine so that a maximum recovery of long fibre will be obtained with a minimum of tow or short fibres which are of much lower value. Good, well-handled straw can give up to 15 per cent. recovery of line fibre from its original weight. Owing to improvements with processing machinery and efficient methods of handling and protecting the straw, the recovery of fibre on original weight at the local mill has increased from 9 per cent. to 11 per cent. over the last two years and with further improvements now under way higher average recoveries should be possible.

GRADING

This starts to take place from the time the line fibre is removed from the scutcher. The fibre is then “dressed” put up into “stricts” finally into “bundles” and baled and branded ready for export to the spinning mills. During the “dressing” operations “pluckings” are obtained and these are baled also, for sale.

Short fibre known as “tow” is collected from below the machines and is baled for sale to spinners.

The woody material or shive is blown to the furnaces where it is burnt and thereby assists in reducing the amount of boiler wood used for heating water for the retting process.

FLAX PRODUCTS

From the foregoing it can be seen that a number of products are obtained from the flax plant. They are, in the order of value—

1. Line Fibre.—The final and most valuable product of the mill, which brings prices according to grades ranging from £250 to £300 a ton. Prices of up to £380 have been obtained.

2. Seed.—For sowing seed and for linseed oil extraction and meal. Seed for oil extraction is sold at about £70 per ton.
3. **Tow.**—This consists of short fibres not fully cleaned which are sold for various prices according to their quality on a clean shiver basis.

4. **Pollard.**—Hammer-milled seed bolls and immature seed used for stock food and sold readily for this purpose.

5. **Winnow Refuse.**—Also sold for stock food.

6. **Soennes Waste.**—Short straws and weeds from the butt ends of the straw frequently sold for packing purposes.

7. **Shive.**—Used for fuel for heating water for retting, otherwise burnt as waste.

Much experimental and breeding work has been, and still is, in progress in this State to endeavour to produce straw free from blemish and capable of producing a high percentage of high quality fibre.

Apart from that, every endeavour is being made to increase the yields of straw obtained per acre by the farmer. Consequently it is anticipated that within the next two or three years a great improvement can be expected both on the farm and in the mill.

Since the author’s trip overseas when investigations were made into the flax industry there, it was obvious that in Australia, certain new techniques had been developed mainly from principles used elsewhere, but many of the standard practices used overseas could be further tried here, even though it is recognised that the crop overseas is sown in the spring and harvested in the autumn which is the reverse to what happens in this State.

Some of these practices designed to raise the yields per acre and to improve the quantity and quality of the fibre, are now being tested. They include closer row spacing, heavier rates of seeding, use of potassic fertilisers and trials with other varieties to assist in obtaining stronger standing straw which is less liable to lodging under adverse weather conditions.

It is essential that the average yield of straw per acre must be lifted as it is only about half the yield of overseas countries where 3 to 4 tons are obtained per acre.

As mentioned previously, greater consideration should be given to better methods of harvesting and more efficient handling of the crop both on the farm and on delivery at the mill if the maximum extraction of line fibre is to be obtained. Mechanical pulling instead of cutting has many advantages in that the farmer obtains heavier yields, no stubble is left to be got rid of and from a disease point of view, control is better, as little or no straw is left on the field to carry diseases over. Apart from this the mill obtains a sheaf free of butt weeds, thereby reducing the amount purchased, as at present a 5 per cent. tolerance of weeds is allowable.

With regard to the breeding programme being carried out by the Department the major aim is to develop a rust-resistant variety with a satisfactory fibre content and grade, from 400 to 500 selections and introductions which are being grown on an experimental site at Boyup Brook. Apart from this work, pure lines of seed are being maintained of the varieties Boyup, Concurrent, Liral Crown, Wada and Currong. This work also includes the introduction of newly-released varieties of flax from overseas and of crossbred materials from Victoria, together with the selections from varieties and development of new varieties by hybridisation.

It is considered that this research programme will be a very important item in assisting the maintenance and production of the flax industry in this State.
Flowers

TO SPEED THE PARTING FRIEND
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MURESK AGRICULTURAL COLLEGE
(Department of Agriculture)

Parents are reminded that applications for 1961 admission to Muresk Agricultural College close on 31st December of this year. A preliminary selection of 1961 entrants is made after the Junior results are available early in 1960.

The successful applicants then continue with Sub-Leaving, or higher studies, in 1960.

Before the course can be commenced students must have attained:

(a) Sub-Leaving Standard in English, Maths, A, Chemistry and Physics (including Magnetism and Electricity).
(b) Junior Standard Bookkeeping.

Should places still exist for 1961 commencement after the preliminary selection early in 1960, they are filled in order of application during 1960, by qualified applicants.

Some places still exist for 1960 commencement and are now being filled by qualified applicants, i.e., those who have or are now taking the correct course at Sub-Leaving or higher standard.

Duration of Course.—Two years.
Fees.—Approximately £130 per annum covering full residential charges.
Scholarships.—Department of Agriculture (3), the “Countryman,” and J. J. Poynton Memorial (2).
Boarding Allowance.—Most Muresk students are eligible for the Education Department Boarding Allowance (£50 per annum).

Full details of the College are obtainable from the Principal, Muresk Agricultural College, Muresk, W.A., or the Department of Agriculture, Perth.

Please mention the "Journal of Agriculture of W.A.,” when writing to advertisers.