THE FIBER-FLAX INDUSTRY IN OREGON WITH PARTICULAR REFERENCE TO MARKETING

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SUMMARY AND CONCLUSIONS

1. The United States produces an average of only 2.6 percent of the total fiber-flax requirements of American consumers. Oregon produced approximately 90 percent of the United States production in 1941, or an estimated equivalent of approximately 10,000 acres. Russia produced more than 80 percent of the world's production of 5,178,000 acres of fiber flax in 1939. Oregon fiber-flax production is concentrated in the Willamette Valley. The quality and high yields of Oregon's fiber flax can be chiefly attributed to the favorable climate and soils in this region.

2. The Oregon fiber-flax industry has grown, since 1915, from one processing plant located at the state penitentiary to two flax-spinning mills and six processing plants, in 1941, which processed the flax for more than 500 growers. Through persistent efforts the Oregon flax industry has gradually won governmental recognition and assistance in the form of favorable legislative and financial aid. This governmental assistance has enabled the industry to overcome the comparative disadvantages under which it had been forced to operate. The protective tariff, governmental subsidies to flax growers, the Works Progress Administration's construction of three cooperative processing plants, and an effective lobby preventing passage of national legislation that would restrict the movement

in interstate commerce of all penitentiary-made goods appear to be responsible for the progress of the flax industry in Oregon.

3. The lack of adequate processing facilities was largely responsible for the organization of growers' cooperative processing plants. The growers were forced to assume the added financial risks of processing in order to convert their almost worthless straw into a marketable form. The existence of these cooperatives prior to 1939 was very insecure. The lack of capital and the comparatively unfavorable price-cost relationship were the principal causes of the insecurity. The lack of available capital is still a retarding factor in the progress of the industry. The internal operating policies of some of the cooperatives, however, have had much to do with their instability in the past. The rapid rise in flax-fiber prices since 1938 has placed the cooperatives in a very favorable position. In some cases, however, this sudden prosperity is being used effectively to prevent detection of the prevailing inefficiencies in the cooperative organizations. The cooperatives should avail themselves of the opportunity to improve their financial position while the prices and profits are so favorable.

4. The State Flax Industry has been a leader in the Oregon flax industry in production, marketing, and processing techniques. It has also been a stabilizing factor in the industry because it has assured the fiber-flax growers a market. The State Flax and Linen Board was created to coordinate the efforts of the industry. Its powers were advisory only. This Board has done much to bring together the several groups interested in flax production and marketing. It is believed, however, that the industry will fare better in the future if control is vested in a central agency with sufficient powers to coordinate and direct the policies and actions of the industry.

5. The United States is the greatest consumer of fiber-flax products in the world. It imports annually approximately 70 percent of its flax requirements in the form of flax manufactures. Another 27 percent is supplied from abroad as raw flax that is manufactured in this country. The imports of manufactured flax, raw flax products, and flax per capita consumption, have been decreasing since the turn of the century. During World War I flax per capita consumption was .8 pound and in 1940

reached a new low of .2 pound. This is due to substitution, principally of cotton for flax, and the preference of new buyers for fibers other than flax. The average per capita consumption of cotton and rayon is increasing; the average per capita consumption of wool has remained fairly steady; and silk consumption is slowly decreasing.

6. The linen industry is controlled by a relatively few large firms that appear to have a passive attitude toward increasing consumer demand for their products. On the other hand, the cotton industry is continually alert and active in creating appealing designs and adding new colors to its products to stimulate consumer demand. The flax fiber has several superior qualities over other organic fibers such as durability and tensile strength. Textile research, however, is revitalizing older fibers and creating new synthetic fibers that are gradually replacing flax fiber for many uses in which the foregoing qualities are desired. Of the total fibers made available to United States consumers in 1940 cotton accounted for 63.9 percent of the total, wool 7.4 percent, silk 0.8 percent, rayon 7.9 percent, jute 11.1 percent, hard fibers 8.5 percent, and flax only 0.4 percent. Incidentally, flax constituted 1.6 percent of all fibers used in the United States in 1900.

7. The Oregon flax-processing plants are dependent on the 12 United States flax-manufacturing mills for their

markets. Most of these mills are dependent for their existence on the high protective tariff they have been able to maintain on flax manufactures. Some of the tariff duties in effect are more than 50 percent ad valorem. The majority of the United States flax-manufacturing mills cannot compete with foreign-made goods without the tariff protection because (1) most of the 4,000 to 8,000 tons of raw flax needed is imported, (2) the costs of production are much higher in the United States, (3) there is a scarcity of experienced flax spinners, and (4) the manufacture of most flax products does not readily lend itself to high-speed machine techniques.

8. The two flax-manufacturing mills at Salem provide the principal outlets for the local processing plants, although some fiber is shipped to the Eastern mills. One local mill produces principally sacking twines and related products, while the other mill specializes in fish nets and seines. Both mills have developed exceptionally stable markets for their products. The lack of the quantity and in some cases quality of the fiber needed has been the retarding factor in the progress of the mills. As a result, they have had to import fiber from The Netherlands and Belgium to supplement the Oregon fiber. The quality of Oregon fiber is highly satisfactory for sacking twine purposes, but for seines and fish nets the quality is inferior to Belgian flax. Oregon grows flax that equals Belgian

flax in average quality, but the difference exists in the methods of sorting and grading.

9. Oregon fiber is bought and sold on the basis of length almost entirely. It is purchased from the grower as pulled flax on the basis of three length grades and sold as fiber to the flax mills on the basis of five length grades. The majority of the European flax is graded and traded on the basis of quality; emphasizing the oiliness and fineness of the fiber. To provide a basis for trading, Oregon fiber is graded by length only. This method of grading is used because, (a) the use made of Oregon fiber does not warrant closer grading, (b) the flax produced in the Willamette Valley is sufficiently uniform in quality for the type of manufacturing use, and (c) trained technicians are not available for grading by other qualities, and the manufacture of high quality linens. Flax-spinning mills are chiefly interested in quality, but when they buy Oregon fiber they have to pay more for the longer flax than for the shorter flax even though the shorter flax may be of the better quality for certain uses.

10. The method of selling flax fiber is unique in agricultural marketing. All sales are made through four or five brokers in New York. The State Flax Industry handles the sales of almost all of the Oregon fiber through a mutual agreement with the cooperative processing plants. No market price quotations are available. A broker will

not release prices to the Oregon marketing agency until the agency has made a bona fide offer to sell a certain quantity of fiber through his agency. Sales are made on the basis of sample, and the prices for Oregon fiber are based on the prices paid for foreign fiber of like quality. The Oregon industry is in a dominant position in the eastern markets at present as a result of the reduced importations of European fiber. The increased dependence of eastern manufacturers on Oregon fiber has given to the Oregon industry a seller's market with a resultant demand for higher prices. Comparatively speaking, the prices for fiber flax at present are considerably out of line with prices for other farm crops and for competing fibers. By their policy the cooperatives are inviting substitution of other fibers. They will not fully realize this until they again have to operate on a buyer's market.

11. Production of fiber flax is a rather uncertain business---cash costs are high, a profitable crop is dependent on ideal weather conditions, it requires an expert to grow the crop, and in most cases the producer must incur the cost of processing before he can market his product. The profitable processing of fiber flax is especially uncertain. Labor costs are high, flax is easily destroyed, poor weather conditions during retting and drying may limit the capacity of the plant, and the price situation is unknown

until the actual fiber is offered for sale. The processing plants operate under the law of decreasing unit costs, the cost per unit up to the optimum capacity varying inversely with the amount processed.

12. For the purpose of reducing and in some cases shifting risks, the marketing contract between grower and processing plant is in common use throughout the Oregon flax industry. By means of the marketing contract the processing plant controls production and marketing of the growers' pulled flax. The grower is assured an outlet for his flax if he performs his obligations. The processing plants in turn are guaranteed a definite volume of flax of the kind and quality desired. In reality a grower belonging to a cooperative flax plant assumes the risks of processing as well as the risks involved in production. Outward appearances would indicate that the processing plants have monopolistic control over the flax producers. In reality, however, they do not have such control because new processing plants may enter the business and the cooperatives cannot control prices.

13. The granting of advances to growers on delivery of their pulled flax into a grower's pool at the cooperative plant is a usual trade practice. Prices paid growers are based on the grades of flax delivered. The final price received by growers is indefinite until the fiber and its

byproducts are sold, which may not occur for four or five years. If private processing plants enter the business and pay the growers a full cash price at the time of delivery, some of the cooperatives may find this type of competition for supply very severe.

14. Considerable research is in progress to reduce the costs of processing. Several improved machines introduced in Oregon have resulted in lower costs, and attempts are being made to develop a new scutcher that will increase the amount of fiber in proportion to tow production. In other areas considerable attention is being given to the possibilities of decortication. Decortication would eliminate retting and open-air drying, thereby instituting the continuous motion principle in processing flax. The system has not been improved sufficiently to yield satisfactory results.

15. Due to war conditions, imports of fiber into the United States since 1939 have been decreasing and the domestic demand for flax fiber is increasing. Prices are considerably higher than costs and as a result new growers and processing plants are rushing into the industry to participate in the profits. As long as the war continues the fiber-flax industry is in a favorable position. The post-war situation is unpredictable but there is reason to believe that the survival of the industry will be

dependent upon continued governmental protection and assistance unless the producers in this country can reduce their costs to more nearly approach those of their foreign competitors.

THE FIBER-FLAX INDUSTRY IN OREGON WITH PARTICULAR REFERENCE TO MARKETING

INTRODUCTION

This is a report on the fiber-flax industry in Oregon with particular emphasis on the methods of marketing fiber flax, and the several factors influencing the marketing of flax fiber and its byproducts. Special attention is given to the marketing agreement, paying growers, financing, assuming risks, assembling, storing, processing, grading, transporting, and selling to the spinning mill or manufacturing plant. The discussion of the final marketing processes involving the manufacture of flax products and the sale of these products to consumers is kept to a minimum. Although the marketing of manufactured flax products is of utmost significance to the Oregon flax interests, the subject is too broad to be covered in this report.

Attention is given to such problems as imports of flax fiber and flax-fiber products, the importance of Oregon's production as compared to world production, tariff legislation, government subsidies, selling, and the ever-current problem of markets. An attempt is made to analyze each of these market forces and to indicate their relative importance in determining the prices flax growers and processing plants receive for their products. In addition a study is made of the many factors determining costs of productions and processing. Considerable emphasis is given the problem of costs as it is of the greatest importance to the Oregon flax industry.

Several manuscripts have been written in the past few years dealing with various phases of the flax industry. Little material has been published, however, relative to the actual marketing functions that have to be performed before the flax fiber becomes available for manufacture. The existing publications are an important source of information and will be referred to when necessary.

Fiber flax is a hardy plant. It can be planted early in the spring, preferably before May 1. The flax is harvested when it is about two-thirds ripe, usually in July, either by hand or machine. The flax is pulled from the ground and bound into sheaves or bundles. It is cured in the field and is then hauled to the processing plant where the fiber is removed from the straw.

Several processes take place in the processing plant before the fiber is finally extracted. The first process is deseeding in which the seed is removed from the straw. This is accomplished either by passing the heads of the flax straw between rollers, or by a machine that strips the seed from the straw by a combing action. The second process is retting. Retting means rotting, and is performed in large tanks. The bundles of straw are stacked upright in the tanks and covered with water where they remain for 6 to 8 days. The water is kept circulating and the temperature is maintained at about 90 degrees Fahrenheit. Bacterial action dissolves the thin-walled tissues surrounding the fiber and certain gums that bind the fiber to the wood. After retting, the bundles of flax are placed upright in large open fields to dry. Drying shrinks the bundles and they have to be rebound by hand or by machine. The dried, retted straw is then scutched, that is, it is passed through a long cylindrical machine in which the straw is broken and the fiber is separated from the woody portion of the stems by means of a flailing process. Hanks of scutched fiber come from the scutcher and the byproduct, scutched tow, is dropped into a bin below the scutcher. The scutched tow is composed of short flax fibers and considerable woody straw material. The scutched fiber is delivered to the hacklers who pass the ends of the hanks of fiber through wooden or wire combs to remove all short tangled fibers and to straighten and separate the long fibers. The hackled fiber is graded according to lengths, bundled, and packed into large bales for shipment to the flax-spinning mills or textile mills where such final flax products as linen fabrics, shoe thread, and fish nets are made.

RELATIVE IMPORTANCE OF THE FIBER-FLAX AND SEED-FLAX INDUSTRIES

Flax fiber was one of the most important clothing fibers available to man through the period of pilgrimage from the Old World to the New and even up until the first World War. Several European countries are still dependent on flax production and manufacture to clothe a portion of their populace. Flax fiber, however, lost much of its prominence as a clothing fiber after 1793 when the cotton gin was invented. The processing of cotton became much less expensive and cotton immediately forged ahead of all fibers for use in the manufacture of textiles.

There are two kinds of flax--fiber flax from which linen and other spun flax products are made, and seed flax from which linseed oil and linseed meal are produced. The variety of seed used for fiber flax is not the same as that used for seed-flax production. Furthermore, fiber flax is sown more thickly than is seed flax since the emphasis is on obtaining a fine, long fiber. Seed flax produces a coarse fiber, not spinnable, as a byproduct. Fiber flax produces flaxseed as a byproduct. A discussion of the competitive importance and relationships of these products follows:

It is evident from a study of the fiber-flax and seed-flax industries that the resulting byproducts have only a minor effect on the supply or demand of either flaxseed or flax fiber. The amount of flaxseed produced as a by-product of the fiber-flax industry in the United States has only a remote effect on the total production, consumption, and price of flaxseed in this country. This condition is more clearly illustrated by comparing recent acreage and production of fiber flax with seed flax. There were approximately 8,000 acres of flax grown nationally for fiber purposes in 1940 as compared to some 3,168,000 acres (14) that were devoted to seed flax.

Oregon fiber flax produces about 5½ bushels of seed per acre. If the same yield per acre were applied nationally the total United States production for 1940 would approximate 44,000 bushels. Flax sown thinner for flaxseed averaged about 9.7 bushels (14) of seed per acre for the United States in 1940, or a total national production of about 30 million bushels. Another ten to fifteen million bushels of flaxseed were imported. Fiber flax produces less seed per acre than does seed flax and the fiber-flax seed yields less oil per pound and the drying properties are not comparable.

Linseed oil is an indispensable ingredient of paints and varnishes and is essential in the making of linoleum, oilcloth, patent leather, printer's ink, and other products. It is estimated that 98 percent of the linseed oil is used by these industries.(14) Linseed meal is used as a feed for livestock.

The straw flax obtained from the three million acres of seed flax has very little influence on the production, consumption and price of flax fiber in the United States. A probable exception is the fiber resulting from seed-flax production that may compete with tow, a byproduct of fiber flax, in the demands of the upholstery trade. The coarse, ripe straw of the seed-flax varieties, as usually grown, does not yield a fiber suitable for spinning. Recent industrial developments in the United States, however, have made seed flax an important dual crop to many farmers. A few farmers growing seed flax are now realizing additional revenue from the coarse, seed-flax straw. The straw is used for the manufacture of cigarette paper and for upholstery purposes. Farmers who can sell their flax straw in these channels have often realized approximately a dollar per acre for the byproduct. Formerly these same farmers were spending time and money getting rid of the waste straw.

Cigarette paper manufacturing became one of America's prominent industries during the last decade. The United States has been importing most of its cigarette paper from France where it was made from linen rags collected from Russia, Poland, and the Balkan States.

The 8,000 acres of fiber flax grown in 1940 appear inconsequential when compared to the 3,168,000 acres of seed flax. Comparable value figures lessen the difference considerably; for example, flaxseed selling at $1.75 per bushel returns about $17 per acre and a total income to United States flaxseed growers of 50 to 60 million dollars. On the other hand fiber-flax growers realized more than $65 per acre in 1940 or a total of more than $520,000 for all growers of fiber flax.

The wide national discrepancy between acreage and returns of seed flax and fiber flax loses all of its significance when comparable statistics are segregated for Oregon. The acreage of seed flax in Oregon accounts for approximately two-tenths of 1 percent of the total national production. Fiber-flax production is another story.

THE FIBER-FLAX INDUSTRY IN OREGON

Records show that the production of fiber flax in Oregon was carried on first near Tualatin, by Mrs. John Kirkwood in 1844.(15) No doubt other Oregon pioneers were also making use of the flax plant at that time for various purposes. Little is known of the production of flax in the Willamette Valley before 1876. About that date samples of Oregon flax began to appear at various fairs and expositions, and one of these won the bronze medal and certificate of merit for its superior quality at the Philadelphia Exposition.

The first spinning mill in Oregon was operating at Albany by 1876. This mill manufactured 5,000 pounds of linen twines and thread per month, according to a recent historical study by the Works Progress Administration.(15) The flax for the Albany plant was grown in Linn County by tenant farmers who paid the owner two-thirds of the crop as a land rental. The Linn County enterprise stimulated the interest of several civic groups that began to consider the possibilities of developing a flax industry in Oregon. Foreign flax interests, principally Belgian and Irish, became interested in the Oregon flax possibilities and subsequently sent flax experts to Oregon to investigate. Their interest did not proceed beyond this point.

Local farmers showed little interest in the crop because of the tedious and costly hand labor required to harvest it.

The flax movement was gaining momentum slowly. Private capital because of lack of experience with the industry could not be induced to invest in flax processing plants, but the state entered the field in 1915. An appropriation of $50,000 was received from the legislature for the construction of a processing plant at the state penitentiary. This plant became known as the State Flax Industry. The legislators intended that this venture should have a three-fold purpose; first, the plant was to provide retting, scutching and marketing facilities for flax growers; second, it was to furnish labor for the inmates of the institution; and third, the state was to act as a leader in the development of the Oregon flax industry.

The present penitentiary plant required additional appropriations and even loans to keep it in operation until 1923. Since that date it has been self-supporting. Convict labor from the state penitentiary was used on private farms to harvest flax. This was necessary to induce Oregon farmers to grow the crop. A cooperative flax plant was operated at Turner, Oregon, in 1923. After one year it suspended operation. The importation of a mechanical flax puller from Canada in 1923 helped to stabilize the flax industry in Oregon by eliminating hand pulling as a means of harvest. The penitentiary processing plant was remodeled in 1927. Regular scutching turbines from Belgium were installed to replace the hand-operated scutching wheels. These developments made available a greater supply of flax fiber; consequently two spinning mills were constructed at Salem by private interests. The first mill was established in 1925, and an other in 1926. Both mills were in operation in 1942.

Just as the State Flax Industry was becoming established, Congress passed the Hawes-Cooper Act of 1929. This law permitted any state to prohibit the sale or transportation within the state of prison-made products produced in other states. This law became effective in 1934. Many of the states took advantage of this law, but only one customer in Pennsylvania was lost by the Oregon penitentiary flax plant. It became apparent, however, that the Oregon flax industry was in danger of disintegration. This was particularly true if other barriers were to be instituted against prison-made goods and if private processing plants were not made available to Oregon flax growers.

Another limiting factor in the expansion of Oregon flax production was the fact that the maximum capacity of the state-owned processing plant was approximately 2,500 acres of flax yearly. In view of these facts Governor Charles A. Martin appointed a flax committee in 1935 to study the needs of the flax industry and to submit a program to aid in the future expansion of the industry. The governor's committee found that large sources of private capital could not be induced to invest in the flax-processing enterprise. It appeared that adequate facilities could be made available to growers only by growers investing cooperatively in the processing plants. This could not be accomplished without governmental assistance. The governor's flax committee suggested that the state sponsor a project in cooperation with the Works Progress Administration to establish three cooperative processing plants in the Willamette Valley. Through financial assistance granted by the Works Progress Administration, processing plants were built in 1936 at Springfield, Canby and Mount Angel. These plants were deeded to the state and are now leased to the cooperatives by the state at a maximum rental of $1 a year. This is a form of state subsidy to the industry. Two new cooperatives have been located at St. Paul and Harrisburg. These plants were constructed by cooperative's growers organizations in 1941 and are now processing part of the 1941 flax crop. At least one more cooperative is expected to be in operation in 1942, and considerable promotional work is being done by certain groups to induce flax growers in several other communities to organize cooperative processing plants. Six fiber-flax processing plants and two flax-spinning mills were operating in Oregon in October 1941. Information relative to the number of flax growers and acreage grown may be obtained by referring to Table 2.

The State Flax Industry

The present flax plant at the penitentiary has an annual capacity of approximately 5,000 tons of pulled flax. This represents slightly more than 3,000 acres of fiber flax. The processing plant pays a nominal wage to each prison inmate based on the tonnage of flax straw handled by each individual. Approximately 175 inmates are employed in the plant. The plant is expected to finance all expenses from products sold, although supplementary legislative appropriations have occasionally been necessary. The salaries of the flax-plant guards are considered as expenses of the plant.

The State Flax Industry is administered by the Oregon Flax and Linen Board created by the Legislature in 1935. The members of the Flax and Linen Board are appointed by the governor for indefinite periods. The members receive expenses only. The administration of the State Flax Industry was in the hands of the State Board of Control prior to 1935. Besides administering the State Flax Industry, the Flax and Linen Board has the duty of coordinating efforts for the promotion of the flax and linen industries in Oregon.

The Cooperative Flax Plants

The three cooperatives at Mt. Angel, Canby, and Springfield lease the buildings and site for a nominal sum of $1 a year from the state through the State Flax and Linen Board. The leases provide that the state shall have no control over the cooperatives unless the plants are operated below 50 percent capacity for two years in succession. The leasing arrangement also prevents the cooperative associations from subletting the buildings without the consent of the Board. The other two cooperatives at St. Paul and Harrisburg are in no way connected with the state, except through the marketing process. This will be discussed later.

Organization of the cooperatives. The cooperatives are organized as "Non-Profit Cooperative Associations" under the Oregon Corporation Law of 1915, as amended. The articles of incorporation and the by-laws are somewhat similar for all five associations. The associations issue common and preferred stock for capital purposes. A summary of the capital stock authorized by each of the associations, its par value, and its requirements as to ownership is shown in Table 14. Common stock is limited to grower-members and carries the privilege of one vote per member regardless of the amount owned. Each member must own common stock and sign the marketing agreement in order to produce and sell flax to the association. Preferred stock is sold to the public but the owners thereof have no voting privileges.

Some associations provide in their by-laws that each member of the board of directors must grow flax each year in order to hold office. This was specified to keep the organization strictly a growers' association. The same provision applies to grower-members, although the time limit is usually extended to two years.

Plant capacity of the cooperatives. The capacity of the individual cooperative flax plants varies but is based primarily on retting capacity and weather conditions. The first three cooperatives originally had an annual capacity of approximately 1,200 tons of flax straw each. It was estimated that this amount would give the processing plants something to do each part of the year. Retting and drying could be done when the weather was favorable and scutching could be performed during the winter months. Each cooperative was equipped with six retting tanks, 16' x 40' x 7', with a capacity of 8 to 10 tons each. As a result of increased production, new retting tanks have been added at each processing plant and the capacity of each has been increased to approximately 1,600 tons per year. The two newer cooperatives have installed sufficient retting capacity to process about 2,400 tons of pulled flax yearly. Retting takes place in April, May, June, July, August and in

September, weather conditions permitting. Retting must be performed during the season of the year when the retted flax may be dried quickly in the open fields, otherwise the flax will overrot and become worthless. The normal Willamette Valley weather limits retting to the months listed; even so it is a gamble during the early spring months. A plant with a 1,200 ton capacity may be able to handle 2,000 tons in one season if the weather conditions remain favorable, otherwise normal weather conditions limit the capacity to 1,200 tons.

The number of storage sheds at the five cooperatives varies. One cooperative has two storage sheds, another has four and the others have three each. Most of the sheds are 56' x 240' x 20' in size. The equipment in each processing plant consists of a scutching machine, deseeder, binder, boiler, scales, retting tanks, and miscellaneous hauling, hackling, binding and packing equipment.

It is the growers' hope to keep the flax plant operating so they can protect their investment in the concern. Some growers may grow flax during a period of adverse conditions as long as they can cover their cash costs even though they are not receiving adequate compensation for their labor. The closer a processing plant can operate to capacity the lower will be the per unit costs. Whenever growers begin to withdraw from the flax growing business and as a consequence deliveries fall below the capacity of the plant the per unit costs will increase. The growers maintaining their deliveries will find that they are receiving lower unit returns, and will tend either to increase their yield or acreage in an attempt to receive a greater total return at the lower per unit price, or will find that it is to their financial advantage to stop production regardless of the loss in investment.

Operating policy of the cooperatives. The number of men employed by each cooperative varies with the amount of flax straw handled yearly, and varies considerably from season to season. The average number of men employed monthly over a year's period does not exceed 15 to 20 for any of the cooperatives. During the retting and threshing season as many as 50 to 60 men are employed daily by a cooperative. Scutching operations in the winter and spring months do not require more than an average of 10 men daily.

The financial statements of two cooperatives reveal that the average annual payroll for labor is approximately $10,000, varying with the amount of pulled flax processed. Processing plants provide a small outlet for labor in the communities in which they are located, thereby adding desirable payrolls. The average annual payrolls of processing plants increased considerably in 1941 as wages have been increased for all employees. The minimum wage varies from 40 to 50 cents per hour. All cooperative processing plants operate on the wage basis. Until recently one cooperative was paying on the piece-work basis, that is, a certain sum was paid per unit of flax straw that each man handled. Per unit rates varied for the different processes of retting, deseeding, and scutching, et cetera. This plan worked very satisfactorily for the cooperative, but the Federal Fair Labor Standards Act forced the cooperative to change its wage plan to a minimum wage per hour. Under the piece-work plan the principal objection was that there was no basis on which employees could be paid for overtime. Labor unions strongly denounce the piece-work wage plan as they claim it works to the detriment of the employee in favor of the employer. The employees of the processing plants are not organized or affiliated with any union. The working conditions of the employees, particularly in the scutching mill could undoubtedly be improved. When the machines are in operation the dust is especially thick and disagreeable. Until 1941 the flax plants have had a struggle to make ends meet without having additional difficulties from labor.

The cooperatives have had very little difficulty with excessive membership turnovers and will have very little difficulty in maintaining their membership at the prevailing high prices for fiber. The number of grower-members has increased considerably for each cooperative since 1936. In fact, the cooperatives contracted for more pulled flax in 1941 than they could process in a year. The acreage and perhaps the number of growers will have to be reduced in 1942 to prevent additional accumulation of pulled flax in the plants, unless new cooperative processing plants are constructed.

The progress of the cooperative processing plants has been measurably hindered by the internal policies of these organizations. Perhaps the most unfortunate handicap of the new or proposed processing plant is the inability to obtain sufficient capital for construction of a plant. The three original cooperatives were fortunate in obtaining governmental assistance through the medium of the Works Progress Administration. The latter processing plants have had to rely solely on stock subscription, and the scarcity of available capital has held back the construction of several new cooperatives. The Reconstruction Finance Corporation has been asked for assistance but has declined to loan money on this type of project. It is understood that the Bank for Cooperatives is willing to loan money to the cooperative flax plants provided they are properly organized and provided they have an acceptable financial policy.

Some of the cooperatives have lacked the foresight to establish adequate reserves for contingencies, working capital, replacement of buildings and machinery, and the retirement of preferred stock. Because of this failure to set aside adequate reserves the cooperatives have found it difficult to borrow sufficient working capital. Such difficulties have caused some attempts by the cooperatives to improve their internal financial structure. One cooperative has made provisions for adequate reserves as working capital and for the retirement of preferred stock and one has made provisions for the replacement of buildings and machinery through a sinking fund, but the majority of the cooperatives are not setting aside enough to be of any consequence in their operations. They still have to borrow money from the local banks or withhold money due the growers in order to make the first payments on the incoming crop and to meet current operating expenses until more flax fiber can be processed and sold.

Complementary to the problem of maintaining adequate reserves is the joint problem of accounting and management. A rather common opinion among the cooperatives is that the expense of maintaining proper records will more likely decrease rather than increase the returns to growers. As a result, management control based on adequate cost records has not always prevailed in the industry.

The cooperatives are becoming aware of the fact that stacks of pulled straw are beginning to accumulate from one year to the next. It was interesting to note the several concepts of the members of the operating cooperatives as to the manner of reaching the optimum plant capacity and as to where expansion should take place to care for the increasing fiber-flax production. Some members thought that an additional scutcher was needed to relieve the pressure, others insisted that another deseeder should be added, while others felt that the solution to the problem was increased retting capacity. The flax experts agree that the principal bottleneck is in retting and drying. If all the pulled flax can be retted and dried before the first of the new calendar year the other operations could be worked overtime to complete the processing of the flax straw before the new crop arrives.

The high costs of processing are recognized to be the biggest detriment to greater expansion of the flax industry. None of the processing firms have had available sufficient resources to engage in a scientific study of methods for reducing processing costs. Two cooperatives did institute comparatively large scale experiments that proved unsuccessful and costly. As a result those cooperatives have lost considerable money for their growers and placed the associations at an initial disadvantage in developing a smoothly running business. New methods of retting, experimental scutchers, and artificial drying are typical examples of some of the experiments that have been carried on. Competent research men have been experimenting with new methods of processing with the hope of reducing costs, but the century-old methods seem to survive. Small-scale experimentation cannot be condemned, but when experiments are conducted that disrupt the entire season's schedule of work the policy can hardly be justified. Those plants that have been processing according to the established methods have continuously made the greatest progress.

SUPPLY FACTORS INFLUENCING FIBER-FLAX PRICES

World Production

The 3,900 acres of fiber flax produced in the United States in 1939 were a very small part of the world's production of 5,781,900 acres for that year. The Soviet Union, Poland, and the Baltic countries supplied over 90 percent of the world's flax prior to World War II, and Russia alone produced approximately 80 percent of the world's supply of fiber flax as shown in Table 1. For the seven years ending in 1937 the United States produced an average of 419 tons; the Soviet Union produced 574,898 tons (1), or over 1,000 times more than what we produced. Half of the Soviet's production, however, is used for industrial purposes within the country and does not enter into foreign trade.

The world production of flax averaged slightly more than 10 percent as large as the total cotton production from 1930 to 1937, which means something like 1,375,500,000 pounds of flax fiber per year.(1) Some of the European countries that promote self-sufficiency as their national policy have subsidized the growing of flax in an attempt to make themselves independent of the cotton producing countries.

The favorable geographical position and the superior Belgian manufacturing methods have made the Belgian flax industry famous throughout the world. In Belgium the growers store the flax and in some cases ret the flax on their individual farms until it is called in by the processing plant. Instead of being paid strictly on the length basis, the fineness and oiliness of the fiber flax are given greater weight in determining the price the grower receives. Foreign flax is sold to the spinners on the basis of fineness almost entirely. The men operating behind the scutchers are so adept at determining the fineness and other desirable qualities of the fiber that they can readily sort the strands of fiber coming from the scutcher into the several grades. Belgium is the most important consumer of raw fiber flax(5), after which comes Germany. The value of exports of fiber-flax products from Belgium is greater than the value of imports, whereas the quantities imported and exported are the opposite. The United Kingdom, especially Northern Ireland, has always been considered by American housewives as the linen center of the world. Ireland produces very little of the needs of her own spinning mills. Considerable flax processed in Irish flax mills originates in Russia and the Baltic countries. The war has reduced Irish production of linen materials because of the inability to get the Russian and Baltic raw material.

With the larger share of the European flax production and processing disrupted, several of the South American countries, especially Peru and Argentina, have developed an intensive interest in the possibilities of fiber flax. It is estimated that the acreage in the two countries in 1940 totalled at least 40,000 acres with Peru accounting for about 22,000 acres of the total.* Peru has been a principal outlet for the sale of Oregon's certified fiber flaxseed for the past several years. Perhaps Oregon is fostering a future competitor in the Latin American countries by supplying this seed, but from a more practical viewpoint, those countries would obtain their seed elsewhere if the Oregon growers refused to sell seed to them.

Oregon Production

<u>Factors determining the quality and supply of Oregon's fiber flax</u>. Flax experts agree that the quality of Oregon fiber flax compares favorably with any flax grown in Belgium, France, or Ireland. This statement can readily be verified by comparing the prices of Oregon and European flax fiber as presented in Table 9. There are several qualities in flax that flax spinners desire. The principal qualities that are taken into account in the judging of flax are: (a) strength, (b) weight for bulk, (c) color

*Data obtained from the manager of the Salem Linen Mills, June 1941.

Table 1

World Acreage and Production
of Fiber Flax

Country	Acreage 2/ 1939	Production in 1000 pounds 1/ Average 1925-29	Average 1930-34	1937	1938	1939
WORLD	5,781,900	1,228,000	1,472,000	1,831,000	1,793,000	
United States 3/	3,553	7,434	7,068	8,864	5,104	9,730
Russia	4,400,000	656,971	1,133,517	1,256,639	1,203,788	1,396,234
Poland	365,000	130,019	71,194	84,014	87,229	
Belgium	110,000	57,950	21,922	52,430	78,064	
Germany	143,000	25,000 4/	370 5/	76,635	66,139	
Lithuania	205,000	80,197	45,936	69,082	56,844	62,898
Northern Ireland	21,000	13,276	6,155	9,479	9,039	

1/ Data obtained from Agricultural Statistics, 1940, page 86, United States Department of Agriculture.
All fiber production figures are apparently in pounds of scutched fiber.
2/ Data obtained from Irish Textile Journal, 5:11:19, November 1939.
World figures exclude United States and China production.
3/ All figures are for the State of Oregon, excluding the production of a small acreage in Michigan and Washington.
Data are for pounds of pulled straw produced. (Scutched fiber produced is about 8 percent of the pulled straw).
4/ Estimate
5/ Two year average.

and uniformity, (d) silkiness or oiliness, (e) fineness or distinctness of separate fibers, (f) length, and (g) cleanness.(1) Whether flax judgers list the preferable qualities in the above order is not known. The length and cleanness of the Oregon-grown straw delivered to the processing plant affects the price paid to Oregon growers, but these two factors are given less consideration in the foreign markets. The processed fiber is sold to the spinning mills by length grades, higher prices being received for the longer flax fiber. The principal reason for basing prices on length of fiber is that fiber flax grown in the Willamette Valley of Oregon has a remarkable uniform quality, as judged by the listed quality factors, varying only in length and amount of weeds. This uniformity can be attributed to the careful selection of soil types by a representative of the processing plant on which fiber flax is to be grown and is stipulated in the marketing agreement. Other reasons for basing prices on length will be discussed elsewhere in this report.

There are two physiographic assets found in the Willamette Valley that are favorable to the production of a fine quality fiber flax. These assets are a mild, agreeable climate and fertile soils.

Climate. That the Willamette Valley has a favorable climate for the production of fiber flax was demonstrated almost 100 years ago by the early pioneers. A cool, moist climate is essential to satisfactory production of the flax plant. B. B. Robinson, one of the leading fiber-flax experts in the United States, has this to say about the importance of a favorable climate:

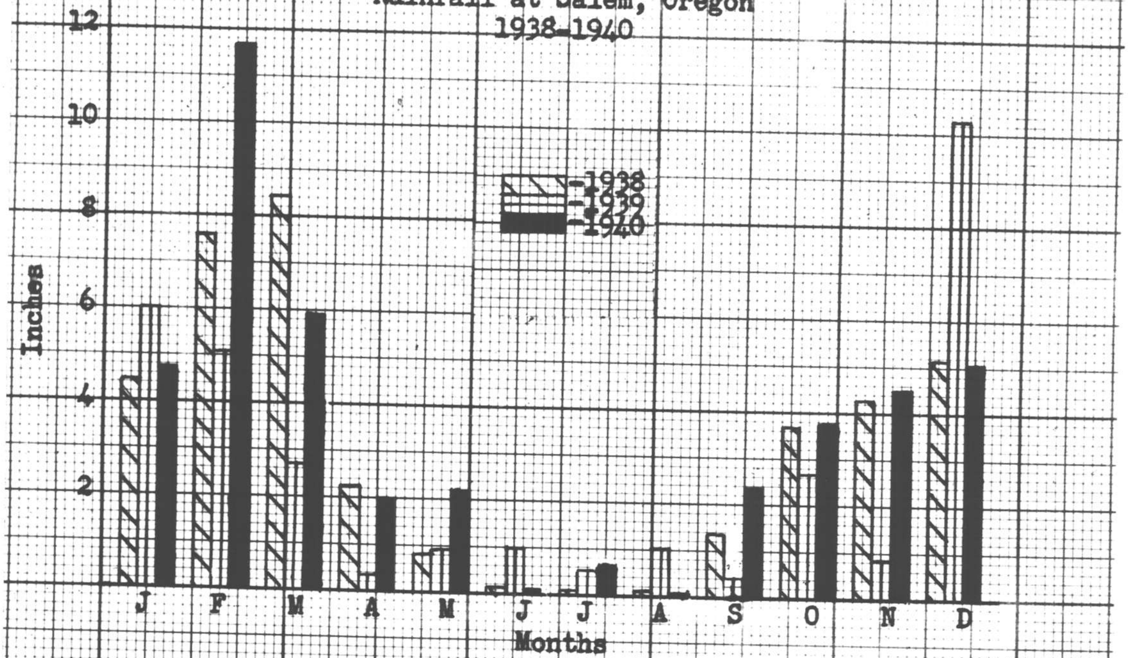
> "Without a suitable climate for the production of fiber flax it is useless to expect to be successful even though one selects the best land and seed and follows the best practices in the culture. It is doubtful whether there is another general agricultural crop that responds so well to a favorable climate as fiber flax."(12)

The average monthly rainfall and temperature recorded at Salem, Oregon, is shown in Figure 1 for the years 1938, 1939, and 1940. A study of the temperature and rainfall data reveals that the Willamette Valley has rather mild winters and springs, with the springs cool and moist which allows early spring planting of the seed. Seeding between March 15 and April 10 is usually recommended. This gives the flax plant a cool growing season until June when slightly warmer temperatures are desired to ripen the flax and at the same time to prevent any lodging that might be the result of too much growth. During the growing period well distributed light showers are preferred to heavy rains. The 1938 season was perhaps the most disastrous season flax growers have experienced for the past decade. The rainfall data for 1938 indicate that approximately the normal amount of moisture fell during the growing season, but the daily rainfall records will bear out the statement that a long period of drouth occurred in May and early June. The flax crop was stunted to such a degree that a great deal of it was hauled in as No. 3 flax, being cut instead of pulled.

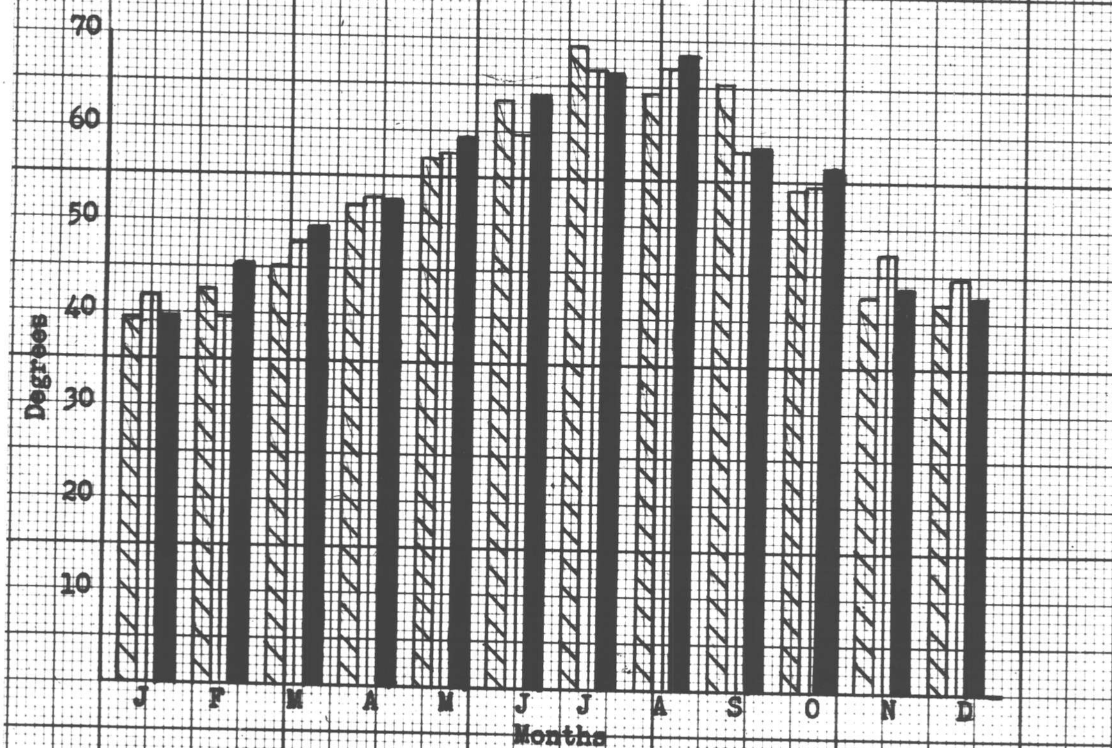
Pulling, or harvesting, is done in July and early August. Fortunately, very few unseasonal rains occur during these months. The rainfall during this period is almost negligible, as is evidenced in Figure 1. The dry weather produces a golden color in the mature flax, resulting in a light colored fiber that is considered more favorable by spinners than the dark colored fiber.(11) These dry summer months are also necessary for the retting and drying processes that take place at the processing plant. There is considerable risk involved in retting and drying during the unpredictable seasons of the year. As a result, usually only a portion of the year's harvest is retted, while the unretted flax has to be stored until the following early summer when weather conditions again are favorable for retting and drying.

The moist winter months in the Willamette Valley are advantageous to the scutching of the retted fiber flax. A certain amount of humidity is desired to prevent the fiber from becoming brittle and breaking into tow in the scutching process.

Figure 1
Rainfall at Salem, Oregon
1938-1940



Temperature at
Salem, Oregon, 1938-1940



Source: Climatological Data, Weather Bureau, United States Department of Commerce.

A processing plant differs considerably in its operations from that of a lumber mill or an assembly line, where one process follows another day in and day out, resulting in the completed product within the space of a few minutes or a day. On the other hand, the several processes in the retting and scutching plant are distinctly seasonal. Several attempts have been made to use quick artificial means of drying the flax after retting. The cost per unit was too great as only a small amount of flax could be handled at one time. Another disadvantage was that the flax straw became too brittle and necessitated careful handling. At one plant a hop dryer was used in an attempt to circumvent open-field drying. The fuel bill was excessive in relation to the price of the product. Until a less costly artificial drying method is perfected or mechanical processing methods are developed to reduce the unit production cost, the Oregon fiber-flax growers and the processing plant operators must depend on open-field drying.

Soil. Soil is equally as important as climate in determining the quality of the Oregon flax fiber, as well as the yield. But the Oregon farmer does have some control over this physiographic factor because he can select the soil type most suited for fiber-flax production. Flax experts advise the selection of a medium textured soil such as a silt loam with good drainage and fertility as the most desirable soil type for flax production. Aage H. Kampp, writing on the geography of the fiber-flax industry(5), lists the following soil requirements as being essential for good quality and yields: (1) light clayey or mellow sandy soil, (2) subsoil not too dry, but well drained, and (3) pH between 6.5 and 7. According to Dr. W. L. Powers, Head of the Soils Department at Oregon State College, potassium and nitrate fertilizers aid the growth of fiber flax. Potash especially seemed to increase the yield and also the length and strength of the fibers.(10)

The selection of a soil type or series adapted to flax fiber for successful production is vital to every flax grower. The hill soils such as Olympic and Melbourne are not very suitable for fiber flax inasmuch as they are too shallow and low in fertility.

The State Flax Industry inaugurated the practice of sending out a representative to the individual farms to select the soils on which fiber flax is to be grown. It is specified in the contract with the grower(Appendix A) that only flax grown on the selected fields will be accepted by the processing plant, thereby giving to the plant the right to refuse all other flax. The cooperatives have adopted this protective measure and as a result a fairly uniform quality of flax has been maintained. However, the expansion of the industry will undoubtedly bring into production poorer soils that will reduce the average yield and quality for the entire Willamette Valley.

It is estimated by Dr. Powers that there are approximately 75,000 acres in the Willamette Valley that could be used annually for fiber flax based on a four-year rotation.(10) If economic conditions warrant, there is a possibility of increasing the future production by seven times the amount produced in Oregon in 1941. If there are 75,000 acres available for planting every year, that means that there are about 300,000 acres in the Willamette Valley that are adapted to fiber flax. The acreage, as determined by Dr. Powers, of the three principal soil series in the valley adapted to fiber flax culture follows:

Chehalis	218,715 acres
Willamette	351,680 "
Amity	277,568 "

It is estimated that 50,000 acres can easily be found within the Willamette and Amity series for flax every year and 25,000 acres in the Chehalis series. Large bodies of the Amity series are not satisfactory unless tiled and well managed to maintain their fertility.

At one time flax was considered to be an excessively heavy soil depleting crop. The crop did poorly when planted on the same ground in successive years, but it was discovered later that it was due to disease conditions rather than to the soil. Recommendations now call for rotation of the crop with grain, clover and a cultivated crop.

Supplemental irrigation on flax has been under experimentation for a number of years at the Oregon Agricultural Experiment Station. Irrigation has given an 8-year average increase in yield of .78 ton per acre, and an estimated average gain in net profit of $13.22.(10)

Area of production. The production of fiber flax in Oregon is concentrated in the Willamette Valley and centers around the city of Salem where two spinning mills and the state flax plant are located. The distribution and density of the flax acreage in the Willamette Valley(Figure 2) indicate the increased development of the industry over the 5 year period from 1936 to 1940. Clackamas, Lane, and Marion counties produced approximately 83 percent of all fiber flax produced in Oregon in 1940. The farmers in these counties have taken the lead in production and as a result each county now has a processing plant, as has Linn county, while Marion county has three.

Trends in production. Oregon production has fluctuated considerably. Acreage planted seems to follow closely to prices received. Correlation of prices to acreage indicates that the general trend is for prices paid growers and acreage to go in the same direction. When prices go down acreage follows. This trend of acreage following prices is common to many other agricultural products. A decrease in acreage, however, does not necessarily imply a decrease in total production(Table 2). Annual production responds to the variations in the physiographic factors of climate and soil. Seeding, cultivating and harvesting practices also influence the total annual production of fiber flax.

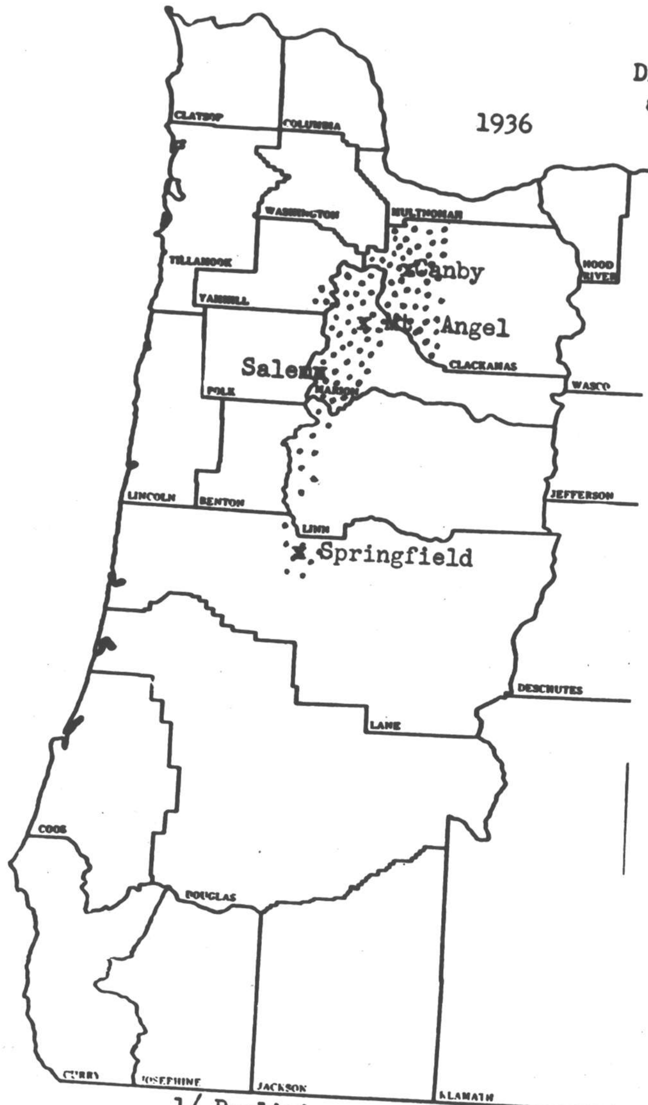
It appeared as though the flax industry was becoming definitely established in Oregon from 1925 to 1930. Yearly acreages continued upward during this period as shown in Table 2. The depression era, however, interrupted the growth of the industry, and a terrific decline in flax acreage resulted, although the general level of agricultural production remained relatively stable(Figure 3). The flax acreage follows the industrial pattern of production for this period more closely than the general level of agricultural production, which would be expected, since the Oregon flax production is extremely sensitive to the activity of the flax-textile industry in the United States. On the other hand, the United States flax-textile industry has been almost entirely dependent on foreign imports of flax fiber. The implication is that Oregon's production is definitely subordinate to the activities of foreign flax producers and industrialists. This will be discussed in greater length in the next section.

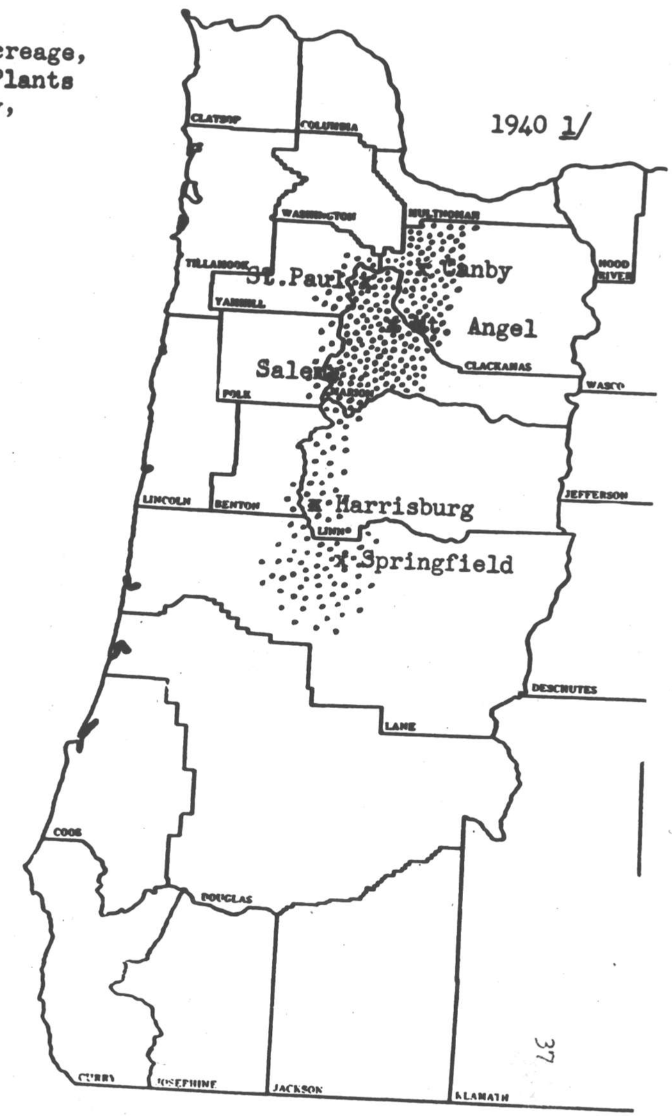
Table 2
Acreage and Production of
Fiber Flax in Oregon
1925-1940

Year	No. of Growers					Acreage					Tons Produced					Yield per Acre (Tons)				
	State Flax Plant	Coop A	Coop B	Coop C	Total	State Flax Plant	Coop A	Coop B	Coop C	Total	State Flax Plant	Coop A	Coop B	Coop C	Total	State Flax Plant	Coop A	Coop B	Coop C	Average
1925	225				225	2100				2100	2654				2654	1.26				1.26
1926	141				141	1644				1644	2376				2376	1.44				1.44
1927	127				127	2100				2100	3803				3803	1.81				1.81
1928	205				205	2782				2782	3805				3805	1.37				1.37
1929	277				277	3462				3462	5949				5949	1.72				1.72
1930	332				332	3811				3811	8741				8741	2.29				2.29
1931	208				208	1793				1793	3018				3018	1.68				1.68
1932	103				103	713				713	1091				1091	1.46				1.46
1933	52				52	461				461	940				940	2.04				2.04
1934	228				228	1904				1904	3881				3881	2.04				2.04
1935	271				271	2465				2465	1429				1429	0.58				0.58
1936	183	62	28	60	333	1516	478	200	543	2737	3251	1004	390	1167	5812	2.14	2.1	1.95	2.1	2.1
1937	103	69	36	66	274	1090	586	390	604	2670	1732	1055	612	1033	4432	1.60	1.8	1.57	1.7	1.66
1938	101	89	—	103	293	1327	862	575	1141	3905	823	578	219	932	2552	0.62	0.67	0.38	0.82	0.65
1939	152	63	20	76	311	2044	253	470	786	3553	2719	157	644	1345	4865	1.33	0.62	1.37	1.7	1.37
1940	189	123	44	120	476	2916	1417	1425	1390	7148	4257	1190	1254	1919	8620	1.46	0.84	0.88	1.4	1.21
AVE.	181	81	32	85	241	2008	719	612	893	2703	3154	797	624	1279	3998	1.57	1.11	1.02	1.43	1.48
Average number of acres per grower						11.1	8.9	19.4	10.5	11.2										

Figure 2
Distribution of Fiber-Flax Acreage, and Location of Processing Plants in the Willamette Valley, 1936 and 1940

Each dot represents 25 acres

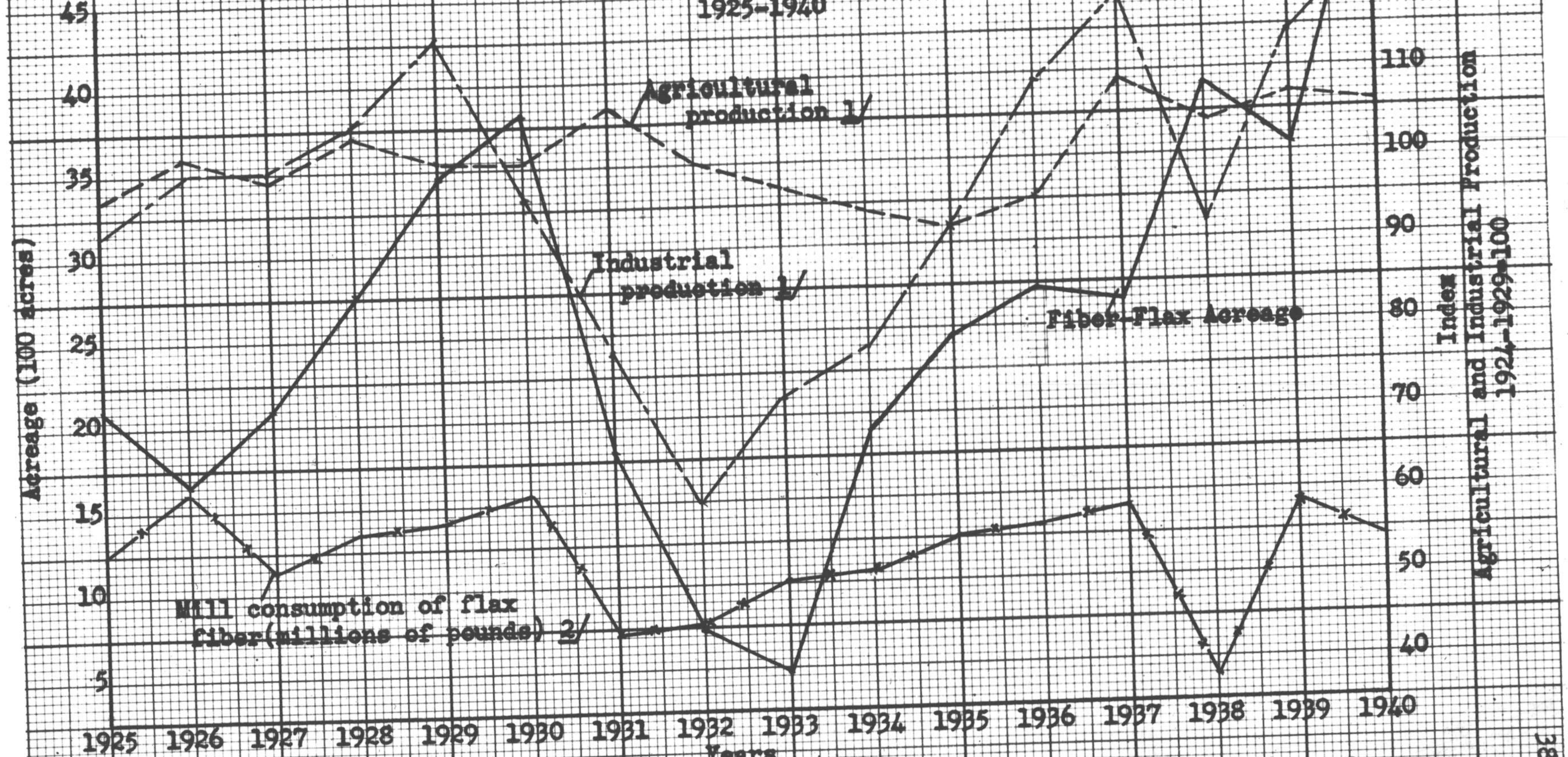




1/ Preliminary

Source: Extension Circular No. 318, Oregon Agricultural Experiment Station, Corvallis, Oregon.

Figure 3
Comparison of Oregon's Fiber Flax Acreage with Industrial and Agricultural Production and Yearly Mill Consumption of Flax, 1925-1940



Source: 1/ 1941 Agricultural Charts, "Demand, Credit and Prices", Bureau of Agricultural Economics and Agricultural Marketing Service, United States Department of Agriculture.
2/ Evans, Robert B. and Monachino, Rose F., "Trends in the Consumption of Fibers in the United States, 1892-1940", United States Department of Agriculture, April 1941.

A comparison of flax-fiber acreage and industrial production indicates that the flax acreage lags behind the industrial production trend by approximately one year. For example, a peak in industrial production was reached in 1929, but the flax acreage peak was in 1930. A sudden decline followed with industrial production reachings its lowest ebb in 1932, but flax acreage continued downward until 1933. This can be partially explained by studying the pricing policy prevailing in the industry. The prices paid growers for flax straw and the prices received for flax fiber are shown in Table 15 and Table 16 respectively. Prices for fiber are established around the first of the new calendar year, and the acreage of the coming production is determined largely by the prevailing prices. Since prices fluctuate from year to year instead of monthly, weekly, or even hourly as for some commodities, the flax industry tends to lag behind the upward or downward movement of general economic conditions.

For a 16 year period an average of 241 growers have been producing flax in the Willamette Valley annually (Table 2). The number of growers has been increasingly above average since 1935. The average total acreage has been 2,703 acres, or 11.2 acres per grower. The acreage grown increased by 101 percent--from 3,553 acres in 1939 to 7,148 acres in 1940--with an increase of acreage per grower to 15. The increase in acreage per grower indicates two definite trends. First, it appears that growers are finding fiber flax an increasingly profitable and thereby a more popular crop. Second, the increase in acreage per grower leads one to conclude that growers are beginning to use less suitable land, which is partially borne out by the low average yield per acre of 1.21 tons in 1940. This may also be the reason why average yields have been gradually decreasing since the cooperatives entered the picture in 1936.

The general trend in numbers of growers, acreage and tonnage in Oregon is steadily upward. The limit is supposedly 75,000 acres. This is the amount of good soil in the Willamette Valley annually suitable for fiber flax. Presupposing a future production of 75,000 acres of flax, a corps of 6,700 growers would be required, averaging 11.2 acres per grower, along with 56 processing plants of 2,000 tons capacity each to process the estimated 112,500 ton crop. The estimated tonnage is based on a yield of 1.5 tons per acre. This enormous production could supply the maximum needs of the present flax-manufacturing mills in the United States.

Alternative opportunities for growers. Fiber flax may be considered one of the elite crops of the Willamette Valley since it requires the very best of soils for most profitable results. On these same soils--Chehalis and Willamette--the farmer has an opportunity to grow many other profitable crops. There are many factors that affect a farmer's choice of crops such as personal likes or dislikes, available markets, length of time to get into production, and capital requirements, but perhaps above all others the factor carrying the most weight with the farmer is the anticipated net income. Fiber flax meets considerable competition from other crops. A number of the competing crops are those in which the Willamette Valley has a comparative productive advantage such as hops and berries. Consequently, the net returns for these crops are normally higher than those obtained from other crops, including fiber flax. The introduction of the mechanical pulling machine in 1923 can be credited with placing fiber flax on a more even competitive status with other crops in the Willamette Valley.

Prior to the war boom some growers were able to produce fiber flax for $20 per ton and still meet all costs. At this low price, however, some growers dropped flax production to grow a more profitable crop. Growers received very poor returns on their 1938 crop, for example, and as a result the number of growers supplying the cooperatives dropped drastically in 1939.

An indication of alternative opportunities for flax growers may be observed by comparing the data in Table 3.

These data are presented as furnished by L. L. Laws of the State Flax Industry.

Table 3

Comparative Per Acre Returns for
Fiber Flax, Wheat, Oats and Barley
(Data obtained in 1936 from 28 general farmers).

Gross Returns per Acre	Fiber Flax	Wheat	Oats	Barley
Flax 2.2 tons @ $25	$55.00			
Wheat 30½ bu. @ 90¢*		$27.45		
Oats 49 bu. @ 38¢*			$18.62	
Barley 42 bu. @ 76¢*				$31.92
Less costs:(per acre)				
Plowing	2.35	2.18	2.18	2.18
Discing	1.13	.82	.82	.82
Harrowing	.75	.50	.50	.50
Drilling or sowing	.65	.60	.60	.60
Weeding	.90			
Harvesting	7.70			
Shocking, tying, loading	2.34	4.63	4.63	4.63
Hauling to market	6.43	2.00	2.00	2.00
Planting seed cost	4.00	2.00	1.00	2.00
Total Costs	26.25	12.73	11.73	12.73
NET RETURNS PER ACRE	$28.75	$14.72	$6.89	$19.19

*Grain prices were taken from quotations in Salem papers, October 1936.

The data were gathered in 1936 from 28 general farms, and they compared favorably with the cost data presented in Oregon Experiment Station Bulletin 354. The data in the foregoing table, however, make no charge for use of land. There is a wide discrepancy in returns between oats and fiber flax, but the margin between flax and wheat and barley is much narrower(Table 3). In fact a slight change in yield or price for fiber flax, as occurred in 1938, could easily make either wheat or barley a more profitable crop to produce. The foregoing figures for fiber flax are above average for yield and price paid to growers by the State Flax Industry in 1936. At the average price of $23.12 per ton and a yield of 2.14 tons(Table 16), fiber flax would have netted only $4 per acre more than did barley. Of course these data do not include the payments of government subsidies for fiber flax. The government subsidies were brought in to accomplish what market prices could not--to make flax growing more profitable and alluring than other crops, thereby causing many farmers to shift to flax production.

<u>The Government's subsidization program</u>. At the request of the growers and interested members of the flax industry in Oregon, the Federal Government was asked that some sort of assistance be given the flax producer in addition to the tariff to stimulate and firmly establish the production of fiber flax. As a result of their efforts, the Agricultural Adjustment Administration has made subsidy payments since 1936. A payment of $5 per ton was made that year, and $7.50 per ton in 1937. No payments were made in 1938. The request was made that in 1939 the payment should be $7.50 per ton with a $1 yearly reduction in payments to be made

thereafter. It was felt that this stronger stimulus was needed at the outset to guarantee a sufficient supply of pulled straw for the processing plants, and as time went by, processing and production would become firmly established and the subsidy therefore could be gradually withdrawn. The payments were to have been $6.50 in 1940 and $5.50 in 1941. Actually the payments made to flax growers were $6.89 per ton in 1939, $4.76 in 1940(4) and approximately $2.77 per ton in 1941. The reason for the drastic reduction in 1941 is that the government allots only a certain amount of money for these payments, based on forecasts of future production. For instance, in 1941, the payment per ton was to have been $5.50. However, the government set aside only $500,000 for these payments. The acreage was increased to 11,400 acres, and at an average yield of 1.61 tons per acre; the expected total yield is 18,354 tons of fiber flax. With an 18,354 ton crop and
$50,000?
only $500,000 to prorate, the average per ton payment amounts to only $2.77.(6)

The subsidy payments are made on a tonnage basis, which means that the larger the tonnage per acre, the greater the subsidy to the grower. Ironically, the grower that may have an unfortunate year gets practically nothing for his crop as well as a very low subsidy payment. Several persons interested in the flax industry advocate payments on the per acre basis.

The Corvallis fiber-flax processing investigations laboratory established and maintained by the Federal Government since July 1938 is another form of subsidy to the industry. The investigational work is being carried on by a staff of engineers seeking ways to improve the present methods of processing. The primary objective of these experiments is to reduce processing costs, thereby increasing the opportunities for higher returns to producers for growing the product.

The tariff levy on flax and flax products is a form of governmental assistance or protection that is more of a protection to the processing plants than to the flax mills or the producers. As the majority of the processing plants are grower owned and operated, the tariff in reality is a protection to the growers as well.

In the discussion of the governmental assistance to the flax industry it is well to remember that the monies for subsidy payments are received directly from the populace through the taxing program of the government. The incidence of the tariff, on the other hand, may rest on the producer, manufacturer, or consumer of the flax products, depending on the supply-demand circumstances. One program was instituted to protect the flax growers and processing plants. The other program was designed primarily to stimulate production, thereby indirectly protecting the processing plants by enabling them to secure a sufficient volume of raw material.

Imports

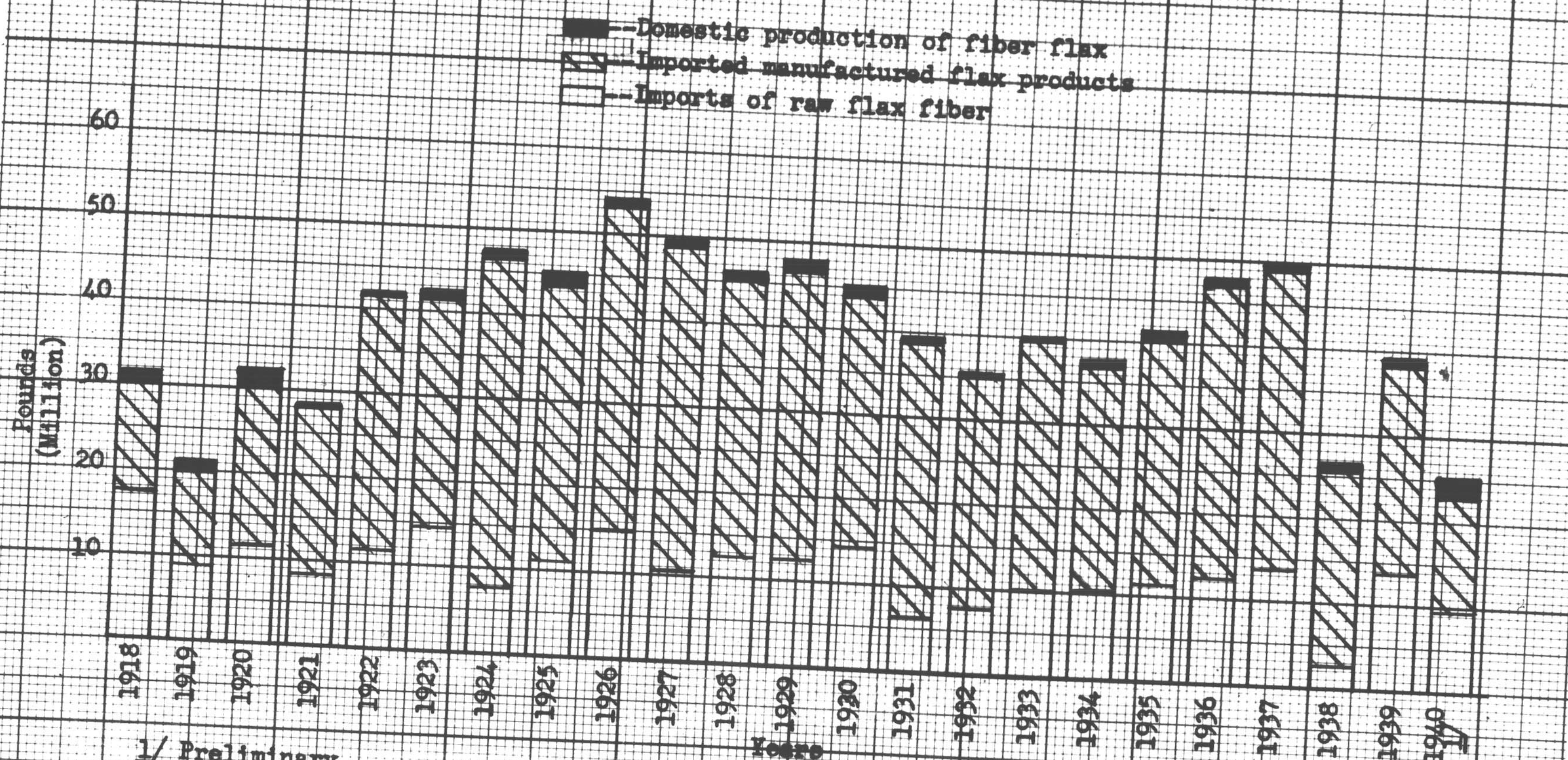
Comparative importance of the flax-fiber industry in the United States. Available information on flax-spinning mills shows that there is, in 1941, a total of 12 such mills, located in Massachusetts, New York, New Jersey, Minnesota, and Oregon. In 1928 there were 18 linen mills in the United States employing 2,530 persons. The 1927 value of their products was $10,377,346; a decrease of one million from 1925.(13) In the past 15 years these mills have been using varying amounts of raw flax, consuming a low of 2,000 tons in 1938 and a high of 8,000 tons in 1926, as shown in Figures 3 and 4. The average for this period was between five and six thousand tons. The quantities of flax fiber produced in the United States to fill the above demand are relatively small. For instance, the 1941 crop was the largest on record with an estimated 11,400 acres(6) in production and an anticipated supply of about 2,000 tons of fiber. Even though production has increased enormously in the past three years, the defense needs in the United States have far outstripped the current supply, and in many industries substitute fibers are gradually replacing flax.

This important problem of the flax industry will be discussed in another section of the report.

The United States domestic production is indicated in Figure 4. This affords a 22 year comparison of the total imports of raw flax, domestic production of raw flax, and the imported flax manufactures that make up the total flax made available to United States consumers. Imported flax manufactures are by far the largest item, averaging about 70 percent of all the flax products purchased by the American public. Imported raw flax accounts for over 27 percent of the total consumed, while domestic production averages only 2.6 percent as its contribution to the American demand for flax products. It is apparent from the foregoing percentages that the United States fiber-flax production has not occupied a very prominent position in supplying the demands of the American people. The American flax industry has resorted to pressure action for governmental aid. The Oregon industry desires higher tariffs and larger subsidies to equalize its competitive position with that of its foreign competitors.

Dependence of Oregon's flax-manufacturing mills on foreign imports. The Salem Linen Mill, locally owned and operated, makes use of about 300 tons of flax fiber each year, but limits production to the coarser twines and threads. Oregon flax fiber is well suited for these purposes and is in great demand by the mill. This organization has imported

Figure 4
Quantities of Flax Made Available
to United States Consumers,
1918-1940



1/ Preliminary
Source: Evans, Robert B. and Monachino, Rose F., "Trends in the Consumption of Fibers in the United States, 1892-1940", United States Department of Agriculture, April 1941.

considerable fiber from The Netherlands and finds that it is of much the same quality as the Oregon flax fiber, thereby permitting the mixing of the fiber.

The Miles Linen Mill, a subsidiary of the vast Barbour Thread interests, has been specializing in the manufacture of gill nets and seines for the fishing trade on the Pacific Coast and in Alaska. This type of product requires a higher quality of flax than is graded out in Oregon. As a result, this company has been importing considerable Belgian flax to blend with the Oregon flax fiber.

The amount of fiber flax imported through the Oregon custom's district, presumably by the two Oregon flax-spinning mills, is shown in Table 4 for the period from 1934 through the first few months of 1941. More comprehensive data are presented from 1938 on, showing the country exporting the fiber, amounts, stage of processing, and value. Argentina flax was tried by one of the Salem mills as a possible future source for some of its requirements. The Argentina flax was found to be off-color and below the quality of the Oregon grown flax fiber.

The Oregon flax mills are receiving enough fiber from the local processing plants to continue operations, but have to pay more for the fiber as the result of competition from eastern mills. The present production of fiber flax in Oregon is sufficient to supply the needs of both the

Table 4
Imports of Raw Flax Through the Oregon Custom
District, 1934-41

Year	Hackled Tons 1/	Value	Unhackled Tons 1/	Value	Tow Tons 1/	Value	Total Tons 1/	Total Value
1934			26	$11,726			26	$ 11,726
1935			95	43,978			95	43,978
1936			126	60,128			126	60,128
1937	15	$6,916	253	124,013			268	130,929
1938			109	50,722			109	50,722
Belgium			25	12,216			25	12,216
Netherlands			79	37,272			79	37,272
Poland			5	1,234			5	1,234
1939	37	25,050	59	29,580	31	$11,321	127	65,951
Belgium			4	2,461			4	2,461
Netherlands	15	6,872	45	20,916	31	11,321	91	39,109
Italy			10	6,203			10	6,203
United Kingdom	22	18,178					22	18,178
1940			52	44,870	7	4,172	59	49,042
Belgium					5	3,153	5	3,153
Netherlands			52	44,870	2	1,019	54	45,889
1941 2/			10	5,376		73	10	5,449
Argentina			10	5,376		73	10	5,449

1/ Ton is 2240 pounds. 2/ Through March 1941 only.
Source of data:
Foreign Navigation and Commerce. United States Foreign and Domestic Commerce 1931-1941.
(1938-1941 data obtained in Portland office of the United States Foreign and Domestic Commerce).

mills in Salem, but the Oregon flax fiber is also in great demand on the Atlantic coast. Naturally, Oregon growers lean toward the higher prices, and as a result more flax fiber is being shipped east than ever before. The local flax mills find themselves in a peculiar situation; during normal times the eastern mills are major competitors for the Pacific Coast market, and during the present emergency period, the eastern mills are major competitors for the raw material.

Imports of manufactured flax products. Approximately 70 percent of the flax products consumed in the United States are produced outside the United States. It is estimated that the value of these imported manufactures range from $30 to $50 million annually. The articles of greatest value, such as table damask, handkerchiefs, woven fabrics, etc. are of such fine quality and workmanship that American spinners cannot equal the products at the prices requested for the foreign goods, even with the advantage of a rather high tariff as shown in Table 7. A list of the flax manufactures imported from 1925 through 1939 are shown in Table 5. The trend of the total imports of flax manufactures is gradually downward, especially since the passage of the Tariff Act of 1930. Woven fabrics constitute over 50 percent of the total manufactures imported, with towels and napkins, table damask and yarns accounting for another 10 percent each.

Of special significance is the decrease of almost 50 percent in total imports from 1939 to 1940. The decrease was spread over every product in about that same proportion. The effect of the European war has shown up more in flax manufactures than it has in the imports of raw flax, the principal reason being that the Irish linen mills were almost entirely dependent on Russian and Baltic raw material, which without doubt was shut off immediately after the war started. If the British Isles had the flax manufactures to sell to the United States, they would do so, because at present they are interested in increasing their dollar exchange.

Imports of raw flax-fiber products. To the thinking of the Oregon growers the amount of raw flax that is imported is of more importance than are the imports of flax manufactures. They stress high tariffs on raw flax without giving much consideration to the tariffs on flax manufactures or the tonnage and value of imported flax manufactures. These items play an important part in determining the prices growers receive for their fiber flax. The imports of raw flax are sizable enough but are exceeded by twice the tonnage and ten to twenty times the value by imported flax manufactures(see Figure 4).

The total imports for the past decade (1931-41) of hackled flax, unhackled flax, noils,* tow and flax straw

*Noils--Short fibers resulting from the machine combing and hackling of scutched fiber.

Table 5
Imports for Consumption of Flax
Manufactures into the United States
1925-1940 1/

Year	Laces, embroider-ies, etc.	Yarns single	Threads twines, cords	Woven Fabrics	Table Damask	Pile Fabrics Mfgs.	Gill nets, webs.	Hose, liquid gas	Sliver & roving	Towels & napkins	Hand-ker-chiefs	Sheets pillow cases	Total 2/
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds
1925	1,172	2,649	708	21,019	3,817	177	28	190	47	2,010	658	130	32,605
1926	1,300	2,718	715	22,132	5,724	488	31	225	54	3,508	925	240	38,060
1927	1,400	2,763	552	20,578	6,164	1,106	37	198	44	3,894	1,193	379	38,308
1928	1,300	2,311	407	17,183	5,345	1,290	44	185	40	2,882	1,239	341	32,567
1929	1,300	2,744	481	18,555	4,843	898	77	166	140	3,028	1,456	354	34,042
1930	900	2,329	357	15,461	3,952	317	26	107	45	4,301	1,223	453	29,471
1931	600	1,938	363	18,215	2,952	475	29	41	202	5,537	1,218	772	32,342
1932	500	1,099	243	16,382	2,768	163	26	24	53	5,134	770	541	27,703
1933	400	1,541	490	19,292	2,335	61	31	7	102	4,704	629	253	29,845
1934	400	1,554	418	16,742	2,259	27	44	11	114	4,285	572	154	26,580
1935	400	1,815	464	18,546	2,010	28	29	10	141	4,520	764	172	28,899
1936	600	2,005	543	23,041	2,368	32	39	23	236	4,669	867	205	34,628
1937	600	2,484	805	21,807	2,715	55	43	10	450	5,433	1,056	204	35,662
1938	400	1,607	563	13,121	1,724	36	22	18	1,039	3,265	986	97	22,878
1939	400	2,116	1,022	15,173	1,915	45	50	9	177	2,951	938	190	24,986
1940	3/500	1,104	596	6,201	1,540	33	13	4/	45	1,872	1,105	153	13,162

1/ Includes small quantity of hemp and ramie items. 2/ Does not include carpets, wearing apparel, tapes, braids and other flax manufactures not shown. 3/ Preliminary. 4/ Less than 500 pounds.

Source of data:
Evans, Robert B., Monachino, Rose F., "Trends in the Consumption of Fibers in the United States, 1892-1939, page 72, United States Department of Agriculture, Bureau of Agricultural Chemistry and Engineering, Southern Regional Research Laboratory, New Orleans, Louisiana, April 1941.

are shown in Appendix B. These tables in Appendix B include the total quantity and value of each of these raw flax products and also the four leading countries that exported these products to the United States during this period. A summary of Appendix B is shown in Table 6.

Since 1931 an average of 4,418 tons of raw flax has been imported into the United States annually at an average value of $1,776,542. Unhackled flax fiber is by far the largest item of the five imported, amounting to almost 50 percent of the average total tonnage. This flax product comprises the most important item of all raw flax imports because many of the flax manufacturers do their own hackling and combing. Manufacturers can take this unhackled fiber and comb it themselves to whatever use they finally desire to make of it. Hackled flax is also an important item to some manufacturers since it can be used almost immediately by spinning mills to be worked into yarns. This flax product accounts for approximately 20 percent of the total tonnage but about 40 percent of the total value. Over a nine year period, 1931-1939, the average value of a ton of hackled flax was $725.45, whereas unhackled flax had a value of only $387.55 per ton. Flax noils constitute about 10 percent of the total tonnage imported but less than 4 percent of the total value of fiber flax imported.

The United Kingdom has consistently supplied this country with about 60 percent or more of the total hackled fiber imported.(Appendix B). The remainder has been obtained from Russia, France, and The Netherlands. Belgium has been the most important source of unhackled fiber for this country, supplying on an average about 50 percent of all that is imported. Russia was the second most important source, with several other countries supplying the balance. It is interesting to note the comparative inactivity for this market by the United Kingdom. The Irish have a comparative advantage in hackling and manufacturing through their years of experience and uncanny skill. They find it more profitable to import their raw material and process it at home for export as finished manufactured goods and small quantities of hackled fiber, than to grow the fiber flax and ship it out as unhackled fiber.

Because of its manufacturing activity, the United Kingdom is also in a position to supply the greater portion of the flax noils that enter the United States. No one country predominates in supplying this country with flax tow. Belgium is a consistent shipper as is the United Kingdom, but the two together seldom ship more than 50 percent of the entire imports of this product.

Tonnage of flax fiber imported into this country since 1910 has shown a considerable decline from 12,761 tons to an abnormal low of 1,251 tons in 1938. The general trend has been downward as may be observed in Figure 4. The decrease may be attributed to the tariff, inroads of

Table 6
Tons, 1/ Price, and Total Value
of Raw Flax Imports into the
United States, 1931-1940.

Year	Hackled Flax		Unhackled Flax		Flax Noils		Flax Tow		Flax Straw		Grand Total	
	Tons	Total Value	Tons	Total Value	Tons	Total Value	Tons	Total Value	Tons	Total Value	Tons	Total Value
1931	517	$265,147	1228	$253,012	29	$ 2,345	1130	$157,906	208	$ 8,995	3112	$687,405
1932	543	253,869	2257	418,519	10	749	521	83,533	194	6,481	3525	763,151
1933	690	425,329	2186	586,567	179	20,073	1381	255,664	246	7,485	4682	1,295,118
1934	1021	678,405	2341	818,022	292	36,128	896	180,109	32	1,393	4582	1,714,057
1935	1246	877,868	2118	998,353	384	61,589	1271	531,290	20	819	5039	2,469,919
1936	1208	947,362	2421	2/1,125,824	499	75,654	1292	322,759	174	7,668	5621	2,488,280
1937	1203	962,053	2750	2/1,314,527	809	150,599	1080	259,431	234	10,985	6141	2,718,163
1938	574	496,557	447	2/ 238,205	62	12,930	45	13,168	118	5,203	1251	767,297
1939	1274	1,097,227	2340	2/1,268,806	1963	223,474	195	72,722	73	3,159	5915	2,687,430
1940	402	554,738	1116 3/	—	1306 3/	—	1486 3/	—	—	—	4310	2,174,601
AVERAGE 4/	868	655,856	2028	786,076	470	64,838	868	208,509	144	5,799	4418	1,776,542

1/ Ton equals 2240 pounds. 2/ Does not include some unhackled flax valued at less than $340 per ton.
3/ Total value of these products is $1,619,863. 4/ Does not include 1940 figures.
Source of data: Foreign Navigation and Commerce. United States Foreign and Domestic Commerce 1931-1940.

substitutes, and the fact that the United States is becoming more self-sufficient in her fiber-flax requirements.

Tariff legislation. The Oregon flax interests have always advocated high tariffs for the protection of the infant flax industry. The Federal government, however, has not always catered to the desires of the comparatively small flax industry. Oregon growers are interested in higher tariffs on raw flax in order to restrict imports and to raise the domestic price. The local flax manufacturers also support a protective tariff. An available and guaranteed supply of fiber is of more importance to them than the threat of losing markets to eastern and foreign goods. They have developed stable markets for their products on the Pacific coast and feel relatively secure from the competition of European and eastern mills. The security of the flax mills is based on the supposition that the tariff rates on flax manufactures will remain at their present levels. The type of product manufactured by the local mills, principally threads, yarns, and twines, is protected by a 25 to 30 percent ad valorem tariff(Table 7).

The policy of the eastern manufacturers has been to support high tariffs on manufactured goods to protect their markets and to abolish tariffs on the raw flax, most of which they have to import from foreign countries. An example of the high tariff rates they have been able to maintain through an effective lobby is shown in Table 7.

Table 7

Ad Valorem Tariff on
Flax Manufactures

Item	Tariff Act of 1930 (percent)	Reciprocal Trade Treaty Tariffs (percent)
Single Yarns of Flax		
Finer than 60 lea	25	15
Not finer than 60 lea	35	25
Threads, twines, and cords	40	30
Gill nettings, nets, webs and seines (valued at more than $1 per pound).	45	30
Woven fabrics	55	50
Towels (tariff based on number of threads to the square inch)	40-55	20-40
Napkins (tariff based on number of threads to the square inch)	40-55	25-30

Source: U. S. Tariff Commission. Changes in Import Duties since the passage of the Tariff Act of 1930. Miscellaneous Series January 1, 1939.

The reciprocal trade treaties were instituted in 1935 by the United States government as part of a policy to foster better trade relations between this country, and foreign nations. The majority of the tariff changes on flax manufactures were concluded in the trade agreement with the United Kingdom effective as of January 1, 1939. The change from the Tariff Act of 1930 on woven fabrics was instituted on May 1, 1935, with Belgium. These tariff reductions apply only to those nations that have signed reciprocal trade agreements with the United States. Other nations sending flax manufactures to this country find that their goods are subject to the Tariff Act of 1930.

These tariff reductions are very much against the wishes of the flax-spinning mills in the United States, particularly on the Atlantic coast. In previous tariff adjustment hearings it has been the contention of the flax manufacturers that their interests should be protected. An illustration of this attitude is cited below from a portion of a brief presented by the J. E. Barbour-Allentown Corporation of Patterson, New Jersey, at the House of Representatives tariff readjustment hearings held in 1929(13), in which this corporation asked that the duty on flax yarns be increased and that the raw flax duties be left unchanged.

> "The only fiber flax grown in this country is produced in Oregon. That state produces about 300 to 350 tons of flax fiber per year, most of which is manufactured into yarn in Oregon. The remaining manufacturers of the United States have had to import on the average for the past six years, 5,510 tons of flax to supply their needs. Thus only 5.1 percent of the annual demand for raw flax can be supplied by Oregon growers.
>
> "Furthermore, there is little or no possibility that this percentage can be increased. Flax, primarily on account of the nature of the processes of retting and scutching is essentially a peasant crop and will not be produced by American farmers. The principal reason why flax is produced in Oregon is because the laborious processes of retting and scutching are performed by the State in the penitentiary with convict labor."

The tariff rates on flax-fiber products have been changed three times during the past thirty years, no doubt reflecting the changes in domestic policy of the several administrations. The changes in tariff rates on flax fiber since 1913 follow:

Table 8

Tariff Rates on Flax Fiber, 1913-40
(Per ton of 2,240 pounds)

Classification	Tariff Act of			Reciprocal Treaties	
	1913	1922	1930	1935	
Flax straw	Free	$ 2.00	$ 3.00	$ 1.50	1/
Flax tow	"	$16.80	$22.40	$11.20	1/
Flax noils	"	$16.80	$22.40	$11.20	1/
Flax, not hackled	"	$22.40	$33.60	$22.40	2/
Flax, hackled	"	$44.80	$67.20	$33.60	1/

1/ Rate lowered as of January 1, 1939 in trade agreement with the United Kingdom.
2/ Rate lowered as of May 1, 1935 in trade agreement with Belgium.

The current tariff rates on fiber flax are the lowest since the Tariff Act of 1913. The high rates resulting from the Tariff Act of 1930 occurred at a time when most of the countries in the world were emphasizing self-sufficiency as the national program. High tariff rates were part of the plan to promote nationalism at home. The majority of the recent changes brought about by the reciprocal trade agreements were made just prior to the present World War, so it is impossible to estimate what effect the lowering of the rates has had on the total imports since 1939.

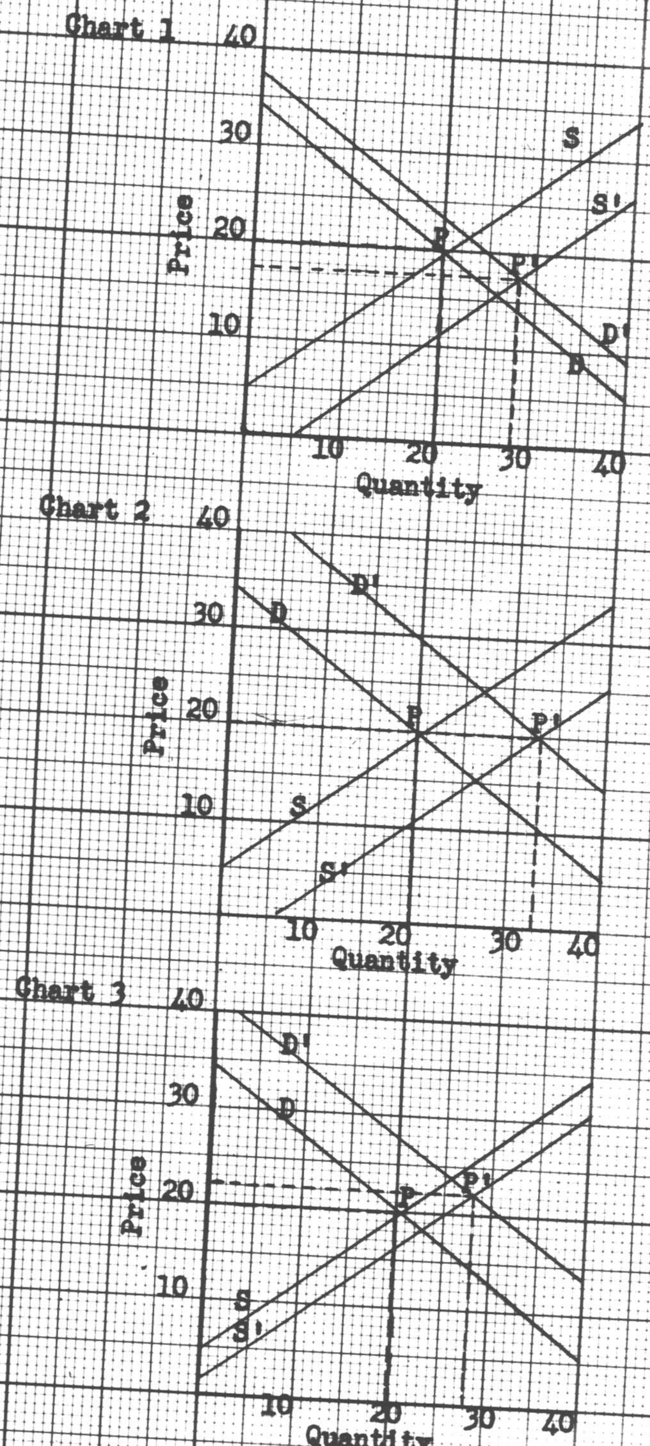
The flax industry has received considerable government assistance in the form of direct subsidies, or tariffs. A review of the industrial or agricultural expansion of the United States will reveal that other industries have received as much or more assistance than has the flax industry. The Tariff Act of 1930, for example, imposed a tariff of 8 cents per pound on alfalfa seed, 65 cents per bushel on flaxseed, 20 cents per bushel on barley, and 42 cents per bushel on wheat.

Probable effects of the tariff legislation on prices. A study of Tables 7 and 8 on tariff rates would indicate that the American public pays an added 50 percent above the price of some flax products as a result of the tariff. Actually, this assumption may or may not be correct depending on the elasticity and relative changes of the supply and demand curves.

It is assumed in this discussion that both the demand and supply curves have an elasticity greater than unity, that is, the rate of change in quantity taken or supplied is greater than the rate of change in price. The governmental tariff policy for the flax industry has a direct bearing on the supply of flax products made available to the American consumers. The program also affects demand but probably to a lesser extent than supply. This would be accomplished by a positive shift of the supply curve, and a relatively stable, or unproportionate shift of the demand curve. It is assumed that more products would be offered for sale at the former price, if the tariff were removed, while the amount taken at the former price would be about the same or slightly increased(Chart 1, Figure 5). The effect of this type of supply-demand relationship would be a reduction in the per unit cost for flax products to the American public. A greater quantity would be sold resulting in greater total returns to the flax industry. If the demand curve remained the same, while the supply curve shifted positively the reduction in price would equal the amount of the reduction in tariff. Any positive shift of the demand curve would reduce the savings effected by the positive shift of the supply curve. Conversely, if the supply and demand curves shifted positively in the same proportion the quantity sold would be larger but the price would be the same and the consumer would be paying the same per unit as before the shift(Chart 2, Figure 5). An improbable situation would be a greater proportionate shift in the demand curve than in the supply curve(Chart 3, Figure 5). This relationship would result in higher per unit prices and an increase in quantity taken. These several illustrations of theoretical price shifts do not portray the possible price shifts resulting from imperfect competition.

Figure 5

Theoretical Supply-Demand Relationships for Flax Products



<u>Price of imported fiber.</u> The average foreign wholesale value in price per ton and price per pound for hackled and unhackled fiber, noils, tow, and flax straw are given in Appendix B. A summary of the prices in Appendix B is shown in Table 9, which also includes the price per pound for all grades of unhackled Oregon flax f.o.b. Salem for comparison with the f.o.b. shipping point prices of foreign unhackled flax fiber. Unhackled fiber flax is used for comparisons since the Oregon processing plants do not sell hackled flax fiber and because unhackled flax fiber is the most important raw flax item imported.

Table 9

Average Price Per Pound of Imported and Oregon Unhackled Flax Fiber, 1931-39.

Country	1931 ¢	1932 ¢	1933 ¢	1934 ¢	1935 ¢	1936 ¢	1937 ¢	1938 ¢	1939 ¢	Ave. ¢
<u>Oregon Salem*</u>										
Average	15.5	14.4	16.0	19.5	21.5	22.8	22.8	22.8	22.8	19.8
<u>Imported* Average</u>										
Belgium	12	14	15	19	21	---	23	25	25	19.2
Dutch	14	16	--	18	19	---	21	21	22	18.7
French	14	8	12	20	21	19	20	30	--	17.9
Russian	--	7	10	11	22	21	21	--	--	
All-Countries	9	8	12	16	21	21	21	24	24	17.3

*Prices are f.o.b. shipping point.

A comparison of prices shows that the 19.8 cent nine-year average of all grades at Salem compares favorable with the 19.2 cent average of Belgian flax or the 18.7 cent average of Dutch flax during the same period. The foreign prices do not include the cost of transportation to the United States, insurance, or tariff charges.

The price of fiber in the United States is determined in the New York market. The Oregon prices are determined by the prices being paid by manufacturers for foreign flax fiber of like quality in the New York market. The Oregon price is that paid by eastern manufacturers less transportation charges from Salem to New York. The cost of transportation by water from Salem to New York prior to the war was $.60 per hundredweight. This amounts to a freight cost of 12 dollars per ton or .6 of a cent per pound on unhackled fiber flax. The transportation cost added to the average nine-year Salem price of 19.8 results in an average total price of 20.4 cents per pound for Oregon flax in the New York market. This does not include insurance costs on the cargo which amount to perhaps 1 cent per pound, and other miscellaneous charges. The freight and insurance costs from these foreign countries are not known but it can be estimated that on the average, Belgian and Dutch unhackled flax sells on the New York market at 19 to 22 cents per pound.

The Oregon prices have also compared very favorably with prices of foreign flax as imported through the Portland custom district. According to Lomax and Van Guilder(8), the freight costs prevailing in 1930 from Belfast, Ireland, to Portland varied from ½ cent to 1½ cents per pound; and marine insurance was estimated at about 50 cents per hundred dollars valuation of the cargo (which includes value of freight space). Prior to the war the average value of Belgian flax at the Portland waterfront was about 21 cents per pound for unhackled flax. This does not include the payment of duty or other charges. These figures correspond closely to the prices quoted by one of the local manufacturers. Of the imported flax bought by his firm the prices had ranged from 19 to 26 cents per pound over a period of years. This same manufacturer stated that his company was willing to pay a premium of two or three cents a pound for Oregon flax over foreign flax. Oregon flax could be obtained within a few days whereas foreign flax had to be purchased at least four months in advance of needs. This condition entailed considerable risk, not only in transportation of the flax to this country, but also in price fluctuations of the manufactured products.

DEMAND FACTORS INFLUENCING FIBER-FLAX PRICES

Markets

United States consumption of flax fiber. The United States is the largest consumer of flax products of any country in the world. The total consumption of flax products in the United States during the 1935-39 period averaged 41 million pounds annually.(3) This was slightly less than the 43 million pounds averaged during the 1895-99 period. From 1910-14 flax consumption increased to an average of 71 million pounds annually, but during the World War I it dropped to 21 million pounds.

The per capita consumption of flax in the United States has been steadily decreasing as may be seen in Table 10, while the total per capita consumption of all fibers has been increasing.(3) Substitution of other fibers for flax and the choice of other fabrics than flax by those buyers entering the market for the first time have affected adversely the flax industry.

Even though per capita consumption of flax products has declined considerably, total consumption has also dropped but is somewhat more stable. Under such conditions it has been difficult for the Oregon manufacturer to become established in the well-supplied markets.

Table 10

Per Capita Consumption of Flax as Compared to Per Capita Consumption of Apparel Fibers and All Fibers, 1892-1940.

Year	Flax (pounds)	Total Apparel Fibers (pounds)	All Fibers (pounds)
1892-94	.6	22.4	30.7
1895-99	.6	24.9	34.4
1900-04	.6	26.9	38.0
1905-09	.7	30.0	41.7
1910-14	.8	29.6	41.7
1915-19	.4	33.2	45.0
1920-24	.4	29.4	40.4
1925-29	.4	31.5	43.1
1930-34	.3	25.1	33.4
1935-39	.3	31.4	40.9
1939	.3	34.3	42.2
1940*	.2	36.7	45.7

*Preliminary

Markets for the Oregon flax-manufacturing mills. If the total consumption of flax products had been increasing rapidly, the Oregon manufacturers would have been able to enter the market more easily. Most of the eastern flax manufacturers have been established for many years and have developed considerable goodwill and consumer patronage. Their products are made chiefly from imported European flax and are usually of excellent quality. The Oregon manufacturers had to meet this strong competition by manufacturing items that could be sold in the nearby markets, principally the Pacific Coast area. Fine woven articles could not be made from the quality of raw flax that was available from the Willamette Valley, and the market for these products was well supplied, not only by eastern manufacturers but by foreign countries, especially Belgium and Ireland. Considering the markets, technical skill, and available flax, the most promising outlook for the Oregon mills has been to manufacture the coarser yarns, threads and toweling. It was in these lines that the two Oregon manufacturing plants made their debut, although the actual spinning of the coarser weaves has been eliminated because of the quality of flax and the limited market for the products.

The two Oregon mills have experienced periods of financial difficulties and reorganizations but have managed to continue in operation. The Barbour Company purchased the controlling interests in one firm in 1928, and obtained complete ownership in 1937 when they immediately started the production of gill nets and seines. Practically their entire output has been confined to these articles. The other firm has continued manufacturing the coarser yarns, sacking twine, hop twine, shoe thread, and similar articles. Flax yarn is woven into crash, toweling, buckram, sheeting, pillowcases, dress linens, handkerchiefs, fire hose, airplane wings, tents, parachute webbing, tarpaulins, tablecloths, and napkins. Of course, only the really fine yarns can be used for making the more expensive articles such as sheeting, tablecloths, et cetera. It is understood that the Salem mills can spin flax yarns up to a fineness of 30 lea, or 9,000 yards per pound. The usual spinning varies between 7½ to 10 lea or 2,250 to 3,000 yards per pound, respectively. The fine yarns used for the high quality goods are spun to a fineness of 120 lea, or 36,000 yards per pound.(12) The exact quantities and kinds of flax products produced by these mills was unobtainable.

Thetwine market, according to Lomax and Van Guilder (8), was the most important outlet in 1930 for Oregon manufacturers, principally for sewing wheat sacks. It was found that an average of 75 percent of the wheat produced in the Northwest came to the terminal markets in sacks, or an average of 14,000,000 sacks of wheat yearly. This market needed between 300,000 and 400,000 pounds of sacking twine annually. Of this amount, Oregon manufacturers supplied 100,000 to 200,000 pounds. Professors Lomax and Van Guilder found a peculiar relationship between the prices of sacks in Calcutta, India, and the amount of wheat sacked annually in the Northwest. When sack prices were high in India, due to a heavy world demand, less grain was sacked and more was shipped in bulk. Lack of bulk storage facilities restricted the influence of high sack prices on the amount of wheat bulked.

The smaller demand, depressed grain prices, and the government loan and crop insurance programs since 1930 have influenced the construction of more storage bins to take care of the unsold wheat. This has had a marked effect on the method of shipping wheat to market. C. W. Wright, Chief of the Oregon Grain Inspection Division, estimates (16) that 55 percent of the grain coming to market is in bulk, whereas twenty years ago only 20 percent came in that form. What effect this change has had on the sacking twine market of the local flax manufacturers is not known. However, one of the local manufacturers recently stated that his firm has developed and maintained a very satisfactory market for sacking twine. Cheaper twines are used for sewing potato sacks, hop bales, mill run feeds, meal bran and other stock food sacks.

The fisheries industry on the Pacific coast offers one of the best markets for Oregon linen yarn. The seines and gill nets used in the industry are made principally from linen yarn. Prior to 1930 there were approximately 8,000 gill nets licensed in the Pacific waters of the United States and Alaska.(8) This does not include another 6,000 gill nets operated in British Columbia. It was estimated that textile fish nets caught $75,000,000 worth of fish in the United States and Alaska, and that this equipment was valued at $16,000,000. The average life of a net is about two years, but each year considerable flax twine is needed for repairing used nets. The foregoing figures give an indication as to the possibilities of this one market alone. Oregon flax could supply more of this market, if the flax fiber were graded by quality rather than length. Oregon can produce the higher quality fiber needed for the finer weaves, but the economic conditions in the flax industry have not warranted a change in grading from length to the more expensive system emphasizing fineness and oiliness of the fiber. As the situation exists at present, Oregon flax must be mixed with the better grades of imported fiber flax to make the better fish nets.

The potentialities of this market are best expressed by the following citation from the report by Lomax and Van Guilder(8), in which they state, "So long as there are salmon runs there will always be a market for flax twine as no better material has been devised for repairing and making gill nets......It is an excellent example of how local industries help support one another. Much of the continued success of the Willamette Valley flax mills depends upon measures taken to preserve the salmon runs."

Further expansion of the flax-spinning industry in Oregon will probably be toward utilization of idle capacity in the two mills. The market, technical skill, quantity and grade of flax are not available for the development of additional facilities for the spinning of finer weaves at present. A great influx of population and industries to the Pacific coast area is occurring. This increasing industrial expansion helps to assure a suitable market for the flax products produced in Oregon. Eventually the markets may be sufficiently developed to support another flax mill.

Markets for the processing plants. The two local manufacturing plants have provided the principal outlets for the unhackled line fiber for the processing plants. Some fiber is shipped to eastern manufacturers. The local flax mills object to the sending of fiber to eastern mills, when they have to import to maintain their supply. The Oregon processors prefer to have their flax manufactured in Oregon, on the other hand, if extra premiums are obtainable in other markets for the better quality flax, sentimentalities are discarded.

Tow, the byproduct of scutched fiber, is not clean enough to be used by local mills; however, all tow produced has been readily sold to a Massachusetts firm for crash towels. The lower grades of tow are used chiefly for upholstery purposes by furniture and automobile manufacturers. One processing plant does clean the tow (removing the shattered woody stems from the fiber), but very little of it is sold to the local mills.

Flaxseed, another byproduct, which is not resold to local growers for seeding, has in late years been marketed in Peru and Persia. The remaining flaxseed has been sold to linseed oil mills or used in making drug meal and stock food. The market for drug meal has been local drug firms and the stock food is readily sold to feeders.

Shives, the woody portions of the stems, are obtained as a residue of the scutching process. This residue has no value except as fuel for the heating plant.

Outlets for the flax growers. The markets for the flax growers and for the processing plants are directly dependent on the operation of the flax mills. If the flax-manufacturing mills in the United States were forced out of business, undoubtedly the Oregon flax industry would collapse also. The Oregon flax fiber could not profitably compete in foreign markets.

The market for fiber-flax straw is definitely a controlled market. Growers producing flax must do so under a marketing contract or suffer the consequences of having no outlet for their fiber flax. Those growers belonging to cooperative flax associations must be members by virtue of common stock ownership and must have signed a marketing contract before they can sell to the association. The State Flax Industry at Salem requires only the marketing agreement of its growers. Very little competition, if any, exists among the several processing plants at present. In the first place, all growers, regardless of the plant they serve, receive approximately the same unit returns. The returns differ only as a result of the variations in operating costs and management efficiency in the several plants. All plants have identical opportunities with respect to market prices. Each plant can obtain sufficient acreage without soliciting growers, whenever prices are favorable. Should private processing plants enter the field, the competitive situation probably would not remain as equitable and amicable as it is at present.

<u>Apparent monopolistic control of flax growers by processing plants.</u> The control exercised by the processing plants over its growers resembles monopolistic control in many respects. Theoretically, such control does not exist in the industry. New firms can enter the industry, and a monopoly owes its existence to the fact that it can control prices, which the Oregon flax interests cannot do. The principal reason for the apparent monopolistic control is that private capital is hesitant in constructing processing plants, thereby eliminating possible competition and alternative outlets for flax growers. It is for this reason that growers have constructed cooperative processing plants. Processing costs are the principal bottlenecks in the extensive development of the flax industry in Oregon. Pre-war prices for fiber and the high processing costs have seldom

offered satisfactory returns to private capital interested in a processing enterprise.

The effect of the present war on the markets. The present war in Europe and the co-existing national emergency in the United States have had resounding consequences with respect to the status of the flax industry in the United States, and especially in Oregon. Small imports of fiber flax are coming from the United Kingdom but they are insufficient to meet the needs of all flax-manufacturing plants. This places a greater demand on Oregon's raw flax and some of the eastern manufacturers are successfully outbidding local manufacturers for the fiber. The United States Army and Navy are very interested in obtaining more fiber flax because flax is needed in the national defense program for such articles as harness and saddle straps for parachutes, fire hoses, some clothing articles, sand bags, marine packing, tents, tarpaulins, and water bags. In fact the Army and Navy are proposing that at least 18,000 acres be devoted to fiber flax in 1942 in comparison with only 11,400 acres in 1941. Naturally the greatest increase is anticipated in Oregon because of its comparative production advantages and the availability of processing plants. The Agricultural Adjustment Administration is continuing to subsidize flax production in the interest of national defense.

Oregon has rapidly become aware of its strategic position with respect to the importance of fiber flax in national defense. Prices received by growers have doubled over pre-war prices, and are continuing upward. Considerable fiber is being shipped east by rail, even though rail rates are $1.65 per hundred pounds. Shipping space on boats is not available. Local manufacturers are producing for defense needs too but must be content with the fiber flax alloted them. Oregon is unable under the present conditions to supply the nation's needs for fiber flax.

As a result of the inadequacy of the supply of fiber flax, research workers are attempting to develop new fibers, and new methods of processing known fibers, as substitutes for flax fiber. Considerable progress has already been made along these lines--especially in treating cotton fiber. Unless improved and cheaper methods of processing fiber flax are developed, this abnormal war demand for flax will cause additional substitution, which may mean a permanent curtailed market for fiber flax.

Substitution

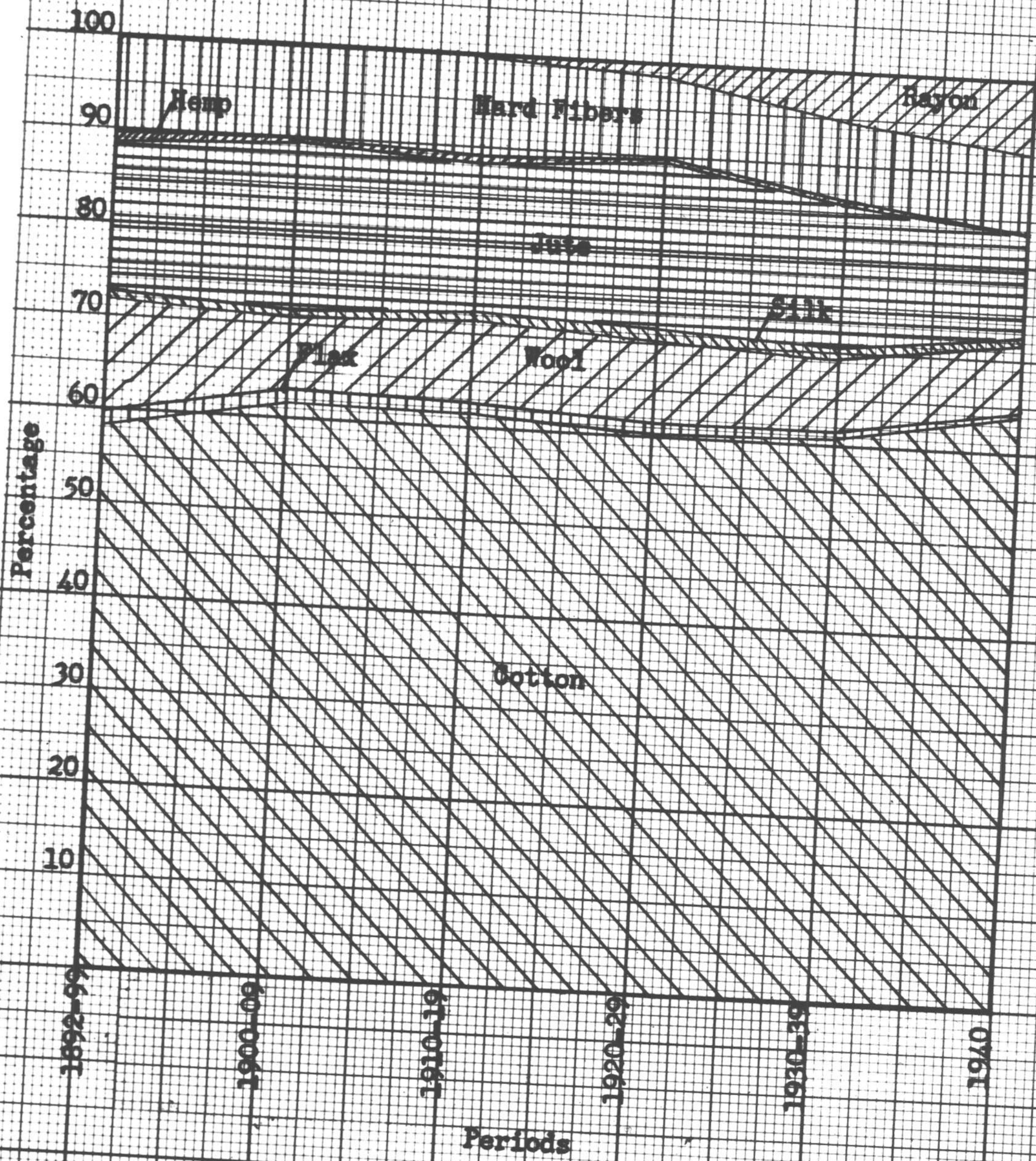
<u>Characteristics of flax fiber</u>. Flax fiber was used by the early Egyptians and in the form of linen is in great demand today by all American housewives. Flax produces one

of the most durable vegetable fibers known to man. The strength of flax fiber becomes doubled when wet, which is not true of cotton. Flax fiber is tough, leathery, and non-elastic, with a smooth surface which makes it suitable for tablecloths, napkins, sheets, and other household uses. It is easily cleaned and does not readily absorb or hold stains. The medical and dental professions prefer linen cloth because it is free of lint and can be easily and effectively sterilized. The absorptive and evaporative qualities of flax fiber make it especially desirable for wearing apparel in the hotter climates. Absorbent flax is preferred to absorbent cotton in that it does not retain the heat, thereby reducing the possibility of inflammation. Undoubtedly there are many other characteristics that make flax fiber desirable for many uses.

Fibers competing with flax fiber. For such articles as sheets, pillow cases, tablecloths, towels, and clothing articles silk, wool, cotton and rayon compete with flax fiber in the markets. Hemp, jute and various other minor fibers compete with flax fiber for the sacking twine, water bag, hop twine, upholstery tow, and similar markets. Several synthetic fibers such as glass and asbestos are finding their way into the fiber market, and appear to be offering severe competition to the vegetable fibers.

The comparative amounts of the various fibers in the United States available for consumption may be obtained from Figure 6 and Table 11. Cotton is by far the most important fiber in use, comprising 63.3 percent of the total fibers consumed in the United States during 1939. Flax consumption amounted to only 0.7 percent of the total that same year, being less than half the amount consumed in the 1892-99 period. Jute was second in total amount consumed in 1939 amounting to 10.5 percent, although prior to 1929 the consumption of jute averaged 16 to 17 percent annually. The total quantities of wool and silk offered consumers in 1939 were 8.0 percent and 1 percent respectively. Hemp consumption amounted to less than 0.5 percent of the total in 1939. Hard fibers (abaca, sisal, henequen, et cetera) used in that year accounted for only 8.3 percent of the total, being at least 2 percent lower than in previous years. A relatively new fiber, rayon, is becoming one of the most important fibers in use by American consumers. In the 1910-19 period, rayon constituted only 0.1 percent of the total, but the trend has been definitely upward and in 1939 amounted to 8.3 percent of the total. In the comparatively brief span of 40 years this fiber has surpassed in importance all fibers except jute and cotton, and no doubt will soon surpass jute.

Figure 6
Estimated Quantities of Designated Fibers
Made Available for Use by Ultimate Consumers
in the United States During Designated Periods,
1892 to 1940,
in Percentages of the Total



Source:
Evans, RobertB. and Monachino, Rose F., "Trends in the Consumption of Fibers in the United States, 1892-1940", page 23, Bureau of Agricultural Chemistry and Engineering, United States Department of Agriculture, Southern Regional Research Laboratory, New Orleans, Louisiana, April 1941.

Table 11

Average Estimated Quantities of Fibers Made Available for Use Annually for Ultimate Consumers in the United States, During Designated Periods, 1892-1940. 1/

Years 2/	Cotton	Wool 3/	Silk	Rayon	Flax	Total Apparel Fibers	Jute	Hard Fibers 4/	Hemp	Grand Total
	Million pounds	million pounds	million pounds	million pounds	million pounds	million pounds	million pounds	million pounds	million pounds	million pounds
1892-94	1,176	254	12	----	39	1,481	304	228	19	2,032
1895-99	1,429	287	15	----	43	1,774	412	246	22	2,454
1900-04	1,801	240	21	----	50	2,112	524	324	20	2,980
1905-09	2,239	276	26	----	55	2,596	647	338	23	3,604
1910-14	2,373	318	35	----	71	2,800	712	412	24	3,948
1915-19	2,864	404	50	3[illegible]	41	3,366	671	512	25	4,574
1920-24	2,691	418	60	7	39	3,234	776	413	16	4,439
1925-29	3,091	406	89	26	49	3,726	912	456	8	5,102
1930-34	2,566	302	78	91	40	3,155	649	382	3	4,189
1935-39	3,203	417	65	169	41	4,058	775	453	3	5,289
1935	2,689	452	74	332	42	3,515	699	466	3	4,683
1936	3,419	454	69	258	48	4,310	821	476	3	5,610
1937	3,571	425	66	320	50	4,417	1,057	483	3	5,960
1938	2,829	313	58	305	27	3,550	718	382	3	4,653
1939	3,509	442	56	323	39	4,497	582	458	3	5,541
1940 5/	3,841	443	48	451	25	4,834	667	514	2	2,017
				477						

1/ Consumption of raw fiber plus additions and minus subtractions for imports and exports of fiber manufactures. 2/ Fiscal years ending June 30, 1917; calendar years, 1918-39. 3/ Includes mohair and camel's hair, etc. (scoured equivalent weight). 4/ Includes abaca, sisal, henequen, etc. 5/ Preliminary.

Source of data:

Evans, Robert B., Monachino, Rose F., "Trends in Consumption of Fibers in the United States, 1892-1939, page 22, United States Department of Agriculture, Bureau of Agricultural Chemistry and Engineering, Southern Regional Research Laboratory, New Orleans, Louisiana, April 1941.

Table 11 presents the same picture as the foregoing percentage figures except that the data are presented in million pounds of fibers made available annually for consumers in the United States.

The development of a new heat-resistant process in the spinning of cotton fiber a few years ago has accelerated the rate of substitution of cotton for flax. This new process increases the strength of the cotton fiber by almost 50 percent, which makes cotton fibers very practical for use in making parachute harnesses and similar articles. The Army and Navy are turning to this material for their needs, simply because of the shortage and high price of flax fiber. A selling point in favor of cotton fabrics over linen fabrics is that the cotton goods have more consumer appeal; that is, cotton materials are made attractive with appealing designs and colors. The cotton industry is pushing its products and uses every conceivable opportunity to create consumer demand. On the other hand the linen industry which is controlled by relatively few firms has been very laggard in this respect.

Wool, silk, and rayon compete to some extent with flax but the competition is not of great importance to the flax industry. Jute is a very good substitute for flax where coarser fabrics are demanded, principally for twines and coarser weaves. Hemp is used to some extent in making fish nets, primarily because of the shortage of flax. Palm leaf fiber and Spanish moss offer considerable competition to flax in the upholstery tow markets. These articles can be obtained for a lower price than the tow of fiber flax.

Modern wars place considerable stress on the fiber and textile industries. Clothing for the armed forces of course is of the most importance but fibers are needed for many other essentials of war. To meet this great demand new fibers are introduced and known fibers are revitalized by new processes. Substitution is inevitable and the high-priced fibers are usually the first to be replaced. During the last war mercerized cotton fabric replaced linen for airplane fabrics. According to F. G. Brown "....there are efforts to substitute glass fabrics which will not burn; vinyon which may be found to melt and seal the edges of holes made by hot bullets so that the fabric will not tear further; or perhaps some other fabric or combination which has these properties or others."(1) It is certain that linen used in parachute webbing, reinforcing tapes, bomb slings, and lacing cords will be replaced by some of the new high strength materials like nylon or the super-strength rayons, which are claimed to have a higher strength than any other natural or synthetic fiber.

The last war ushered in considerable substitution of other products for linen, and flax fiber has never been able to regain its previous foothold. Large quantities of linen were used by hotels, railroads, and housewives prior to the war but during the conflict cotton sheets, towels, et cetera, came into use and these articles have remained on a cotton bases ever since.(8)

Table 12

Average Market Prices for Several Fibers, 1931-39 1/

Year	Cotton2/	Wool3/	Silk4/	Flax5/	Jute6/	Rayon7/
	(¢/pound)	(¢/pound)	($/pound)	(¢/pound)	(¢/pound)	($/pound)
1930	10.38	63	3.415	----	5.0	1.059
1931	6.34	50	2.401	15.5	3.7	.758
1932	7.37	40	1.561	14.4	3.0	.660
1933	11.09	61	1.612	16.0	3.3	.609
1934	12.44	74	1.298	19.5	3.8	.587
1935	11.75	64	1.633	21.5	4.3	.573
1936	12.93	80	1.766	22.8	4.3	.586
1937	8.75	87	1.858	22.8	4.6	.623
1938	8.99	59	1.706	22.8	4.3	.522
1939	----	69	2.718	22.8	5.7	.515
AVERAGE	10.00	64.7	1.997	19.8	4.2	.6492

1/ Agricultural Statistics, 1940. United States Department of Agriculture.
2/ In New York market.
3/ In Boston market, Scoured Basis, Territory, Grade 56's (Three-eighths blood combing).
4/ New York prices.
5/ Average price of all grades of line fiber f.o.b. Salem, Oregon.
6/ New York prices.
7/ 150 A Denier (fine yarn-size commonly used).

Prices and consumption of competing fibers. A comparison of prices for the several leading fibers as shown in Table 12 will explain the principal reason for the tremendous amount of substitution of the several fibers for flax.

The price of cotton over this ten year period(Table 12), has averaged about half the price of flax, and yet most cotton is still harvested by hand, while most domestic fiber flax is machine harvested. Machine separation of flax fibers may again make flax a potent competitor of cotton. Flax is approximately five times higher in price than jute, which means that jute has undoubtedly made deep inroads into the flax markets where coarser articles are concerned. Flax does not enter into much competition with the other fibers, rayon, wool and silk. These fibers have distinctive characteristics which make them especially desirable for various items of wearing apparel, even though they are considerably higher in price. Silk, and to some extent rayon, has a certain esthetic value even though prices are three to six times greater than the prices of competing fibers. Flax, too, has an esthetic value, especially in the finer articles, which cannot be replaced by any other fiber. For this reason there will probably always be a certain demand for linen goods regardless of the competition from other fibers.

All silk and jute used in this country must be imported, and the greater percentage of flax is also imported, whereas the United States produces 80 percent of its wool needs and is an exporter of cotton. The fact that cotton is a surplus crop in the United States accounts for the low prices of cotton during the past decade. The Federal Government has attempted to stimulate the consumption of cotton at home through various programs. The cotton consumed under these programs may not be in direct competition with flax articles but may divert future consumer purchases away from flax.

A study of the per capita consumption of all fibers shown in Table 13 reveals that cotton per capita consumption is increasing gradually, and wool consumption is holding its own. Silk per capita consumption has increased considerably since 1892 but has gradually declined from the pre-depression period of 1925-29. Rayon is shooting upwards rapidly but flax is slowly losing ground. Flax has the lowest per capita consumption of all fibers--only .2 per pound per person in 1940.

Table 13
Per Capita Quantities of Fibers Made Available for
Ultimate Consumers Annually in the United States,
During Designated Periods of Years, 1892-1940.

Years 1/	Cotton	Wool 2/	Silk	Rayon	Flax	Total Apparel Fibers	Jute	Hard Fibers	Hemp	Grand Total
	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
1892-94	17.8	3.8	.2	——	.6	22.4	4.6	3.4	.3	30.7
1895-99	20.0	4.1	.2	——	.6	24.9	5.8	3.4	.3	34.4
1900-04	22.9	3.1	.3	——	.6	26.9	6.7	4.1	.3	38.0
1905-09	25.8	3.2	.3	——	.7	30.0	7.5	4.3	.3	41.7
1910-14	25.1	3.4	.3	3/	.8	29.6	7.5	4.3	.3	41.7
1915-19	28.2	4.0	.5	.1	.4	33.2	6.6	5.0	.2	45.0
1920-24	24.5	3.8	.5	.2	.4	29.4	7.1	3.8	.1	40.4
1925-29	26.1	3.4	.8	.8	.4	31.5	7.7	3.8	.1	43.1
1930-34	20.5	2.4	.6	1.3	.3	25.1	5.2	3.1	3/	33.4
1935-39	24.8	3.2	.5	2.6	.3	31.4	6.0	3.5	3/	40.9
1935	21.1	3.5	.6	2.0	.3	27.5	5.5	3.7	3/	36.7
1936	26.6	3.6	.5	2.5	.4	33.6	6.4	3.7	3/	43.7
1937	27.6	3.3	.5	2.4	.4	34.2	8.2	3.7	3/	46.1
1938	21.7	2.4	.5	2.5	.2	27.3	5.5	2.9	3/	35.7
1939	26.8	3.4	.4	3.4	.3	34.3	4.4	3.5	3/	42.2
1940 4/	29.1	3.4	.4	3.6	.2	36.7	5.1	3.9	3/	45.7

1/ Years are fiscal years ending June 30, 1917; calendar years, 1918-39. 2/ Includes mohair, camel's hair, etc. 3/ Less than 0.05 pound. 4/ Preliminary.

Source of data:

Evans, Robert B., Monachino, Rose F., "Trends in the Consumption of Fibers in the United States, 1892-1939, page 29, United States Department of Agriculture, Bureau of Agricultural Chemistry and Engineering, Southern Regional Research Laboratory, New Orleans, Louisiana, April 1941.

THE MARKETING PROCESS

The marketing of fiber flax in Oregon differs somewhat from the marketing of many other agricultural products, for instance, fruit and vegetables or even grain. Some agricultural products are produced and sold directly to the consumer, while others are sent through a canning or manufacturing process in which the form and time utility of the product is altered. The marketing of flax straw in the form of the final flax product requires one more step in manufacturing or processing than do most other agricultural products. There are three different commodities through which the marketing processes for flax can be traced: flax straw from the grower to the processing plant; scutched fiber from the processing plant to the flax-spinning mill; and the final flax products from the flax mill to the ultimate consumer. The actual study of the marketing processes in this report is limited to the flax straw and flax fiber.

Producer to the Processing Plant

Purpose and function of the marketing agreement. Although the marketing agreement has considerable influence on the production of fiber flax, the principal purpose of the agreement primarily affects the marketing of the flax straw. The marketing contract is an instrument designed to protect the interests of both the flax grower and the processing plant, and as such is usually signed and in effect by the first month of the calendar year. The contract is considered a chattel mortgage whereby the grower obligates his flax crop as security for his performances of the contract and in turn the processing plant agrees to accept all flax produced by the grower under the conditions specified in the contract.

Considerable risk is involved in the production, processing, and marketing of fiber flax. One or all of the principals performing these functions must bear the risks. These risks are not readily passed on to the consumer. The division of risks is the major purpose of the marketing contract. Weather conditions, fire, price fluctuations, legislation, and other factors constitute the risks involved in the production and marketing of fiber flax. In the Oregon fiber-flax industry, the grower of flax straw must assume the greater portion of the risks. Unfavorable weather during the growing season is the grower's greatest hazard. The crop must be harvested at the right time or it will become coarse, harsh, and brittle. Furthermore, the grower in marketing his flax through the processing plants is not assured a definite price. Until the final payment for his crop is made and the payment pool is closed, which may not occur for a year or two, the unit price is problematical. Members of the flax cooperatives, being the owners and operators of the processing plant, must share the responsibilities of processing and possible destruction or liquidation of the plant in addition to the risks they must assume in growing the crop.

Price fluctuations are perhaps the greatest risks of the processing plant. Unforeseen and adverse legislation, or weather conditions, may also be disastrous to a plant. Without a marketing contract with its growers, a processing plant would have no assurance of a regular supply of raw material. Growers can readily switch to an alternative crop, but the processing plant is a fixed one-crop investment that must be maintained and must return at least a nominal amount on the investment or face liquidation. A period of low prices could accomplish this quickly. Some of the risks can be shifted by means of insurance, but price fluctuations are not normally insurable. The degree of risk varies with the length of time between the purchase and sale of a commodity. This holds true for the fiber-flax industry. A period of a year may be required from the time of original purchase of pulled flax until the product is processed and sold.

The State Flax Industry originally used the marketing contract not only to reduce risk, but also to control the acreage to prevent an undue expansion of flax production without available processing facilities.

It is almost imperative that flax growers obtain marketing contracts. The growing of top-quality fiber flax requires special skills in selecting the soil, seeding, harvesting, and drying, of which the average farmer is not fully aware. The processing plant, as well as the grower, is interested in obtaining the longest and best quality flax possible, as the greatest returns come from the long fiber. Through years of experience, the State Flax Industry officials found that the best way to insure maximum returns for both parties was through almost complete control of production by means of the marketing contract.

The marketing contract (Appendix A) is typical of the contracts used by the State Flax Industry and the several flax cooperatives. The contract specifies that the grower must obtain his seed from the processing plant and must sow a certain minimum number of pounds of seed per acre not later than May 1 or May 15. The seed must be sown on land selected by a representative of the processing plant and the crop must be harvested at a time specified time and as directed by the representative. No land on which flax was grown any of three preceding years can be used. Other provisions list the schedule of liquidated damages for non-performance or breach of contract and the statement that the processing plant has first lien on the flax crop. The cooperative associations do not allow the assignment of an agreement without their consent and also provide for cancellation of part or all of the agreement by one or both parties if the other is notified in writing before February 1 of the new crop year. The flax contract used by the State Flax Industry differs somewhat from the foregoing by going into more detail as to the method of harvesting and hauling of the flax to the plant. The advance payment is specified for the three grades of flax, and the grower is granted the option of delivering his product into the pool or accepting full payment at the time of delivery at the price quoted the cooperative associations for their surplus flax.

Grades and grading. The first step in the actual marketing process begins usually in the early part of July when a representative of the processing plant grades in the field all flax contracted by the processing plant. Each field is graded separately, and the grading is done prior to harvesting while the flax plant is still upright. The grader estimates the percentages of the three grades of flax in the field. The grades are (a) No. 1 flax which is flax 30 inches or more above the ground, (b) No. 2 flax which is 25 to 30 inches in height, and (c) No. 3 flax which is all flax below 25 inches. Some recognition in grading is given the nature or oiliness of the flax straw, coarseness, strength and amount of weeds. The foregoing information is written on a separate tag for each field and the grower must present the tag at the processing plant upon delivery of the flax.

The representative of the flax plant must be highly experienced to be able to judge or estimate accurately the percentages of the three grades in each field in order to satisfy both the growers and the processing plant. The estimates made by the representative of the processing plant are the figures used as the basis for the payments to the growers. Flax experts estimate that one-fifth more fiber can be obtained from No. 1 flax straw than from No. 2 straw; consequently prices for each grade are determined accordingly. If No. 1 flax receives $30 per ton, No. 2 flax will receive approximately $24 per ton. Even a variation of 10 percent in the grader's estimate of each grade, therefore, may result in considerable money loss or gain to an individual farmer and the opposite to the processing plant. As prices go higher, the amount of money that can be gained or lost becomes greater. It is therefore expedient that the processing plant send out a representative that is an expert in judging and grading flax. The expenses incurred by the grader are borne by the processing plant.

Harvesting, drying, and hauling. These processes are to be performed by the producer as agreed to in the marketing contract. The representative of the processing plant at the time of grading specifies the time and method of harvesting the crop. Flax is harvested when it is approximately two-thirds ripe and the seed has not passed through the dough stage. Only the No. 1 and No. 2 flax straw is pulled, either by hand or with a mechanical puller. No. 3 flax is mowed and hauled to the processing plant loose, similar to hay. Mechanical pulling has replaced hand pulling almost altogether except in small fields, or if the crop is down, and around the edges of the fields where a path is prepared for the pulling machine.

Harvesting must be performed only in dry, warm weather. The puller has a binder attachment and the resulting sheaves are set up in shocks in the field to dry and cure. The straw must be perfectly cured to prevent molding while in storage.

Transporting costs and plant locations. Hauling of the dry pulled straw to the plant is done when requested by the processing plants. Growers stand the expense of hauling, using various types of carriers, depending on the distance of the haul, to transport the straw to the processing plant. Flax is bulky; therefore it cannot profitably be hauled for any great distance. This accounts for the location of the cooperatives in the center of the production areas and no doubt is one of the reasons why flax processing plants are not operated in conjunction with flax-spinning mills.

It is difficult to draw a line of demarcation between production and marketing of the flax crop. Harvesting is the termination of production and at the same time the flax straw is being prepared for market. In the cost study of fiber flax in Oregon by Kuhlman and Robinson,(7), pulling, shocking, tying, loading, and hauling were considered part of the harvest costs and also part of the cost of production. The total harvest costs amounted to $8.33 per ton or approximately half the total cost per ton of producing fiber flax. Pulling accounted for $4.53 of the harvest cost per ton, shocking, tying, and loading only $.93 and hauling the remainder, or $2.87. In the cost study, the authors found that the average haul from the farm to the processing plant was 21.1 miles, and resulted in an average cost of $.14 per ton-mile.

Financing production and marketing. According to Kuhlman and Robinson,(7) 63 percent of the total cost of producing and marketing fiber flax is an out-of-pocket cash outlay. Very few crops grown in the Willamette Valley require such a large cash expenditure. The greatest amount of cash cost arises in the harvesting, drying and transportation of the straw to the processing mill. The flax crop is usually harvested under contract to contractors owning pulling machines. A pulling machine costs approximately $850 and only a few growers own machines. The 63 percent cash outlay referred to includes the cost of seed of approximately $2.50 per bushel. Under the present arrangement the majority of growers do not pay outright for their seed. As all seed is obtained through the processing plant, the amount of seed obtained is charged to the grower's account and deducted from the first payment made the grower. Nevertheless, the actual cash outlay still amounts to 50 percent or more of the total cost.

With such high cash outlays, the fiber-flax enterprise is considered a risky business. A small yield or low prices may cause a heavy loss. The State Flax Industry at one time financed these various processes as a stimulant to production, but it has ceased that practice. At present the State Flax Industry has an arrangement with its growers whereby they may obtain the needed harvesting and marketing outlays from a bank through an assignment on the flax crop with the consent of the State Flax Industry. On delivery of the straw to the plant, the State Flax Industry pays the bank the amount of the assignment and deducts this amount from the grower's returns. Some of the cooperatives have similar arrangements with their growers. Of course, many growers are financially independent and others can withhold payments to the contractors and laborers until the time of delivery of the flax, when a payment of approximately $20 per ton of No. 1 flax is obtained.

Flax growers find it difficult to borrow money from credit agencies for two reasons. First, the possibility of loss is greater than on most crops. Second, the processing plant holds first mortgage on the crop which precludes the possibility of some agencies loaning money to flax growers.

Processing Plant to the Flax-Manufacturing Mill

Assembling and storing. The flax straw is assembled at the processing plant from the contracted growers when it is cured. Each load of straw delivered is weighed in at the plant. In unloading the straw the checker selects a few bundles of straw from the load, weighs them, and then removes all weeds, dirt and other foreign matter. After reweighing the bundles the dockage for weeds and dirt is determined from the samples taken. The amount of dockage is applied to the entire load, and in some cases to the entire crop of the particular farmer. The dockage averages from 4 to 6 percent at all the processing plants. As the straw is delivered from each field, the owner must present the tag given him by the field representative at the time of grading in the field. From the information on this tag the straw is directed to the several storage sheds. An attempt is made to keep all bundles of short and long straw separate and to keep the coarse flax straw apart from the finer flax straw. This is the only grading in which the quality of the straw is given consideration. This is very crude grading, since each load, and for that matter, each bundle may contain several grades of straw, but the normal usage of the pulled straw does not warrant closer grading.

Not all of the pulled straw is directed to the storage sheds. Some of the straw is sent directly to the deseeding shed and then to the retting tanks. All straw is delivered to a cooperative pool and each grower receives only an advance payment for his crop. The pooling provisions and prices to growers will be discussed later.

Processing. Several excellent treatises have been published which discuss in detail the various processes of deseeding, retting, and scutching. These various functions will be referred to only when necessary to preserve the continuity in the presentation of the marketing process.

The various processing functions are the devices by which the form utility of the practically valueless flax straw is changed to a mass of flax fibers and byproducts which have an added value of two or three times that of the original flax straw. Perhaps the greatest research problem confronting the flax industry is this problem of processing. Considerable research has been done in devising new and more economical methods to replace the antiquated processing methods still in existence. Under the present system the straw must be handled four different times following each process because after each process the straw must go to the storage sheds until needed. It is an economic axiom in industrial management that additional handlings increase costs materially. This is more fully discussed under the section of costs.

Financing the processing functions. The cooperative processing plants attempted to finance the construction of their processing plants by issuance of preferred and common stock. Common stock sales are limited to growers only. Preferred stock is sold to the public and in case of liquidation of the plant the preferred stockholders are paid first. The associations reserve the right to call in any preferred stock or common stock for resale to new members, provided the entire stock of one member shall not be called in for the purpose of depriving that person of his membership. Provisions also are made that a member wishing to sell his common stock must first offer it to the association. If it is not accepted by the association within a certain time, he may sell it to any other member or potential member with the approval of the association. The preferred stock is callable at any time from anyone for redemption at par value. When dividend payments are voted to preferred stock, the rest of the earnings are prorated to members on the patronage basis. One association issues equity certificates in lieu of common stock to any person or firm otherwise qualified to hold common stock who does not choose to become a member of the association. The equity certificates hold no voting privilege, but in other respects are treated similarly to common stock. These certificates can be replaced with common stock at the option of the association. The amount of stock authorized by each cooperative is presented in the following table, Table 14.

Table 14

Capital Stock Authorization, Value, Dividends, and Requirements as to Ownership by Members

Firm	Stock Authorized	Shares Common Stock	Par Value	Dividends	Shares Preferred Stock	Par Value	Dividends	Shares Common Stock Required of Member
Coop A	$ 40,000	1,500	$10	6%	500	$50	6%	1
Coop B	40,000	2,000	10	5%	400	50	6%	1
Coop C	50,000	2,500	10	6%	2,500	10	6%	1
Coop D	100,000	2,000	25	6%	2,000	25	6%	1
Coop E	50,000	3,000	10	8%	2,000	10	6%	3 per acre of flax

None of the plants sold the amount of stock authorized; some fell short by several thousands of dollars. Three of the cooperatives were out only about $15,000 for machinery, as the buildings were provided by the Federal Government and deeded to the state, and some still were not able to sell enough stock to buy even the machinery. The total cost of a plant is about $40,000. As a result, the available working capital was scarce. Those that fell short had to issue stock for labor performed, and borrow money on the incoming crop from local credit sources. Government credit agencies refused all applications for loans. The government financial assistance granted the three cooperatives gave them a decided advantage over the new cooperatives in tax and insurance rates. Their buildings are insured through the state restoration fund which applies to all state-owned buildings. One cooperative on completing new storage sheds deeded the buildings to the state; consequently, the cooperative's insurance rates are low and it does not have to pay taxes on the real property. This results in a considerable saving in annual costs. The cooperatives have had a very shaky beginning, the biggest disadvantage being the lack of adequate working capital.

It is estimated that operating expenses for the operation of the processing plants average from $1,500 to $2,000 a month. The majority of these are out-of-pocket expenses. In addition to money for these expenses, capital is needed to purchase the raw material. A total working capital of $30,000 to $35,000 is needed by the average cooperative for operating capital and advance payments to growers. The lack of capital permitted only meager advances to the growers at the beginning. The pooling arrangement for payments to growers, a device common to almost all cooperatives, was the salvation of the cooperative flax plants during their infancy. Consequently, the flax growers indirectly financed the various processing functions, and for that matter still do. They assumed tremendous risks over a long period of time without substantial financial remuneration. Inadequate finances were the primary causes for internal dissension in those cooperatives that were on the verge of bankruptcy.

Even with improved economic conditions the majority of the cooperatives are dilatory in providing adequate working capital and a sinking fund for future replacement of machinery and buildings. One cooperative has made provisions for setting aside a reserve of $5,000 a year for 5 years. This should provide adequate working capital, but the other two operating cooperatives that were investigated were not giving sufficient attention to building up adequate reserves.

The common argument against establishing reserves is that the growers have been suffering from depressed prices, therefore they are entitled immediately to a prorated share of all earnings. Another argument is that the old members do not feel that they should be assessed for a reserve fund to benefit new members. This could be circumvented by establishing a revolving fund reserve. Under this system a few low-numbered or old revolving fund certificates are paid out each year while new members must contribute to the fund and in lieu thereof receive high-numbered revolving fund certificates to be paid off several years hence.

Cooperative processing plants should be eligible for loans from the Bank for Cooperatives when they straighten out their financial difficulties and provide reserves sufficient to meet the Bank's minimum requirements.

Standardizing and preparing for sale. Sorting of the scutched fiber into five different grades is the final step in the flax processing function. The small bunches of fiber gathered from the scutching machine are moved on to the hacklers. The short fibers removed by this hand-hackling process are called pullings. The butts are the pullings obtained from the bottom end of the fiber, and the tips are pullings from the top end. The pullings in comparison to the amount of fiber obtained run about 5 percent for the tips and 4 percent for the butts. The hand-hackled fiber is then sorted into five grades according to length. The grades are: (a) 5X, 31 inches and up, (b) 4X, 28 inches to 31 inches, (c) 3X, 25 to 28 inches, (d) 2X, 22½ inches to 25, and (e) 1X, 20 inches to 22½ inches. Each individual hank, or bunch of fiber, is sorted into one of these classifications. Should a bunch contain two or more distinct different lengths an attempt is made to segregate the various lengths, but in most cases the separations are highly arbitrary.

There are no definite standards for flax which can apply the world over; none have been devised. Flax mills buy strictly on quality, which is the basis of European grading, whereas Oregon grades are based primarily on length. Under Oregon's conditions this type of standardization is permissible because, (1) the use made of Oregon fiber does not warrant closer grading, (2) the flax produced in the Willamette Valley is sufficiently uniform in quality for the type of manufacturing use, (3) trained technicians for grading by other qualities are not available and the manufacture of high quality linens, (4) flax is purchased from the producers according to length, and (5) some standard measurement is necessary in order to provide a basis for trading. Should market opportunities warrant grading by other standards, the Oregon fiber-flax industry could meet the challenge but would have to institute new grading and storing methods starting in the flax field. Under the present system a better quality of flax may be obtained in the 3X grade than in the 5X grade, yet the longer flax draws the higher price. In the preparation of the fiber for sale, the fiber in each grade is assembled into bundles of about 30 pounds each and the bundles into bales of about 300 to 325 pounds each. If the fiber is sold locally it is usually not made up into bales, but all fiber shipped out of the state is packaged in bales and the bales covered with burlap. The No. 1 tow is packed by presses into bales of about 150 to 165 pounds each. The No. 2 and No. 3 tow are usually recleaned before being shipped in bales. The seed is sold in 112 pound bags (two bushels) and is usually cleaned before being sold. The seed used for seeding purposes is cleaned thoroughly and tested for purity and germination. Stock food and drug meal are also sold in bags.

Selling. The selling of the raw flax products is much different from the methods of sale for most other agricultural products. The channel of the original sale is strictly through brokers who act as contact men for both buyers and sellers. The brokerage business is in the hands of a small number of brokers in the New York market, who guard closely their business secrets. No market reports or even market quotations are available on flax fiber for any market. The principal reasons are that the amount of business conducted is small and is controlled by a small group, and there are no definite standards or grades on which price quotations can be established. All fiber is sold by sample or inspection to the flax mills. Under normal conditions, the foreign flax offered for sale establishes the price, and Oregon flax is priced accordingly.

The brokers will not quote the selling prices to the Oregon marketing agency unless the Oregon group sends them samples of the fiber they have to sell and makes bona fide offers indicating willingness to sell a certain quantity. The principal reason for withholding the selling prices is that the brokers, who are highly experienced flax men, have a virtual monopoly on the selling activities. In this respect there appears to be an unusually close association between the few brokers and the eastern manufacturers. If the brokers quote prices to the Oregon group they will make no commissions by so doing, because the Oregon interests can sell all their flax directly to the local flax mills without dealing through a brokerage firm. Consequently, the Oregon marketing agency must sell some flax through the brokers in order to obtain the selling prices for quotations to the local mills. Even though there are no particular world-wide standards established by which flax can be sold, the Oregon flax corresponds in quality with the Dutch and Belgian flax. If it were known what the Dutch or Belgian flax was selling for in the New York area, the local flax group could establish comparable price quotations for the local trade.

The selling operations take place in the following manner: In the fall the Oregon flax marketing agency, which is the State Flax Industry, sends representative samples of the several grades of fiber (1X to 5X) to its broker in the New York market offering to sell a certain quantity of each grade. The broker wires back that according to the sales of foreign flax, Oregon flax fiber hasacertain value. If the price is acceptable to the seller, the broker is permitted to sell the amount specified at that price to any flax mill.

Under present war conditions, the selling situation has reversed itself in favor of the Oregon industry. The Oregon group can practically set its price, that is, a reasonable price. The eastern brokers are making the preliminary inquiries as to the quantity of Oregon flax that will be made available to them for sale. Previously they were also the bargaining agents for the now curtailed foreign flax-fiber importations, and the Oregon flax fiber was unimportant in comparison to their total trade. The brokers charge a commission varying from 1½ to 2½ percent depending on the products sold. The commission on fiber is lower than that on tow or pullings.

Because of the peculiar circumstances surrounding the determination of prices and the method of sale, the State Flax Industry under oral agreement has agreed to act as the marketing agency for all cooperatives. Cooperatives, however, may sell independently if they desire. Selling through one agency simplifies and facilitates the marketing problems of the individual cooperative and makes for better coordination of effort of the entire flax industry in the state. All cooperatives have taken advantage of this opportunity except one. This organization has been selling principally through the American Flax Association, a private organization. Whenever a sale is made through the marketing agency each cooperative is allowed to supply a prorated share of the order. Prorations are based on the total quantity of fiber each cooperative has for sale.

Sales through eastern brokers are made principally f.o.b. Salem. At present shipments to the eastern markets are being made by rail as shipping space on boats is scarce; however, the abnormally high prices on fiber more than compensate for the high freight rates. Besides, the eastern mills are desirous of quicker shipments than could be made by the circuitous water route. The fiber delivered to the local mills is transported by truck, usually f.o.b. the flax mill. The prices quoted the local mills are always New York prices less transportation costs, or about 2 cents per pound less.

Determining prices received by processing plants. As has been mentioned in other sections of this report, the price of fiber is determined, under normal conditions, primarily by world conditions of supply and demand for fiber. The amount Oregon produces has a negligible influence on the prices flax mills are willing to pay. The prices Oregon processing plants receive for their flax fiber are set by the eastern mills and brokers after examining samples of the Oregon product. Table 15 gives the price received f.o.b. Salem for the several flax products produced by the Oregon processing plants. The price of scutched tow is also determined by supply and demand conditions that influence world trade in flax. Tow is also sold by sample through brokerage firms to eastern mills. Most of the seed from fiber flax is sold at a premium for seeding purposes after being thoroughly recleaned and certified. The prices for butts and tips, or pullings, are set by the Oregon marketing agency in relation to the prevailing price on fiber. All pullings are sold strictly to local manufacturers. Drug meal is sold to western wholesale drug firms and to manufacturers of breakfast foods. The price is governed by the flaxseed price. Stockfood is made from chaff and screenings and is sold locally as livestock feed. The 1940 price for drug meal was $5.60 per hundredweight and for stockfood $10 per ton net.

Table 15

Prices F.O.B. Salem for Several Flax Products, 1931-40.

Year	5X	4X	3X	2X	1X	1st Grade tow	2nd Grade Tow	Tips	Butts	Seed to Mills
	¢/lb	¢/lb	¢/lb	¢/lb	¢/lb	¢/lb	¢/lb	¢/lb	¢/lb	$/lb
1931	18½	17	15½	14	12½	--	--	6	8	1.52
1932	17	16	14½	13	11½	6	4	6	8	1.25
1933	19	17½	16	14½	13	6	5	6	7½	1.64
1934	21½	21	19½	18	17	6	5	6	10	1.92
1935	23	22½	22	21	19	6	5	6	10	1.65
1936	24	24	23	22	21	7	5½	6 3/4	10	2.05
1937	24	24	23	22	21	9	5	7½	12	2.15
1938	24	24	23	22	21	8	5	7½	12	1.95
1939	24	24	23	22	21	8	7	9	15	1.73
1940	49	49	47	45	43	15	10½	14	20	2.00
AVERAGE	24.4	23	22.7	21.4	20	7.9	5.8	7.5	11.25	1.79

Source: State Flax Industry

The data in Table 15 show that line fiber* yields the largest per unit returns of any product produced from the flax plant. The average price for the five grades of line fiber over the ten year period is 22.5 cents per pound; the present price of fiber is about 60 cents per pound. This price of 22.5 cents for one pound of fiber almost equals the total price per pound received for all other

*Line fiber--all grades of unhackled or scutched fiber. Long, spinnable fiber as compared to the short, unspinnable fibers in tow.

products combined(Table 15). The comparison is not indicative of the actual importance of line fiber to all the other flax products because the returns from a pound of fiber amount to about 70 percent of the total price received for all flax products. For example, in processing the quantities of the other products produced in relation to one pound of line fiber are as follows: about 2 pounds of seed, less than 1 pound of stockfood, .65 pounds of tow, and .1 of a pound of pullings. To extend the comparisons further, the amount of line fiber, tow, seed, and pullings obtained from a pound of flax straw accounts for only about 30 to 35 percent of the total weight. The rest of the straw is lost as shives or waste material.

It is evident from the foregoing discussion that the prices received for the several products are determined by the usage made of the particular product and the conditions of supply and demand. Even though the prices received for the several products under normal conditions are outside the control of the processing plant, the processing plant is in a favorable position to control, to a considerable degree, the total price received, barring the effects of the individual price-determining factors. This can be accomplished through its control over selection of soil types and production of the flax fiber, and through its effectiveness and efficiency in processing the flax straw.

Financial returns of the processing plants are based primarily on the price and production of line fiber. If through better management or greater mechanical and production efficiency, the amount of fiber produced can be increased and the byproducts produced in proportionately decreasing amounts, the larger will be the financial returns from a ton of pulled straw. This is also of importance to growers since their returns are directly dependent on the total price received for the flax products less the amount needed for processing and the other marketing costs.

Prices to growers. The prices that growers receive are dependent on several factors: the quantity and grade of flax delivered to the processing plant by each individual member, the price of line fiber and flax byproducts, the operating costs of the processing plant, and the amount set aside for reserves and other accounts by the cooperative processing plant. The growers delivering to the State Flax Industry are affected only by the first three factors mentioned. The column on average price per ton paid growers in Table 16 shows reasonably well the average returns to growers. A slight difference exists in prices per ton received by growers from the several processing plants. Since the price available for fiber and the byproducts is usually the same to all the organizations the factors accounting for the differences in prices to growers would

Table 16
Influence of Yield per Acre and Percentage of Long Flax on Gross Returns per Acre and Average Price per Ton paid Growers

Year	Yield per Acre (Tons)				Average Price Per Ton Paid Growers				Gross Returns per Acre				Percentage of Long Flax 1/			
	State Flax Plant	Coop A	Coop B	Coop C	State Flax Plant	Coop A	Coop B	Coop C	State Flax Plant 2/	Coop A	Coop B	Coop C	State Flax Plant	Coop A	Coop B	Coop C
1925	1.26				$31.60				$39.82				74			
1926	1.44				37.20				53.75				93			
1927	1.81				34.85				63.10				84.5			
1928	1.37				33.85				46.30				88.5			
1929	1.72				34.65				59.50				96			
1930	2.29				36.00				82.55				93.5			
1931	1.68				23.35				39.28				37.5			
1932	1.46				21.17				32.38				68			
1933	2.04				19.41				39.57				99			
1934	2.04				22.50				45.85				100			
1935	0.58				16.30				9.45				37			
1936	2.14	2.1	1.95	2.1	23.12	$28.38	---	$24.33	49.58	$59.60	---	$51.09	91	86	---	91
1937	1.60	1.8	1.57	1.7	24.93	29.50	---	27.99*	39.60	53.10	---	47.58*	86.5	88	93	75
1938	0.62	0.67	0.38	0.82	19.20	29.50	$16.00	16.06*	13.70	19.76	$ 6.08	13.17*	26	**	0	26
1939	1.33	0.62	1.37	1.7	32.23	29.50*	29.74*	51.93*	41.88	18,29*	40.74*	88.28*	68	**	81	61
1940	1.46	0.84	0.88	1.4	44.48*	41.50	34.68*	40.58*	62.27*	34.86	30.52*	56.81	60	**	71	62
AVERAGE	1.57***				$27.36***				$43.75***				76.2***			
1930-39 Average	1.61				$24.46				$39.38				70.7			

1/ Long flax--30 inches or longer. 2/ In some cases includes returns for short fiber flax not accounted for in the yield per acre. * Pool not closed. ** Not graded. ***Does not include 1940 figures.

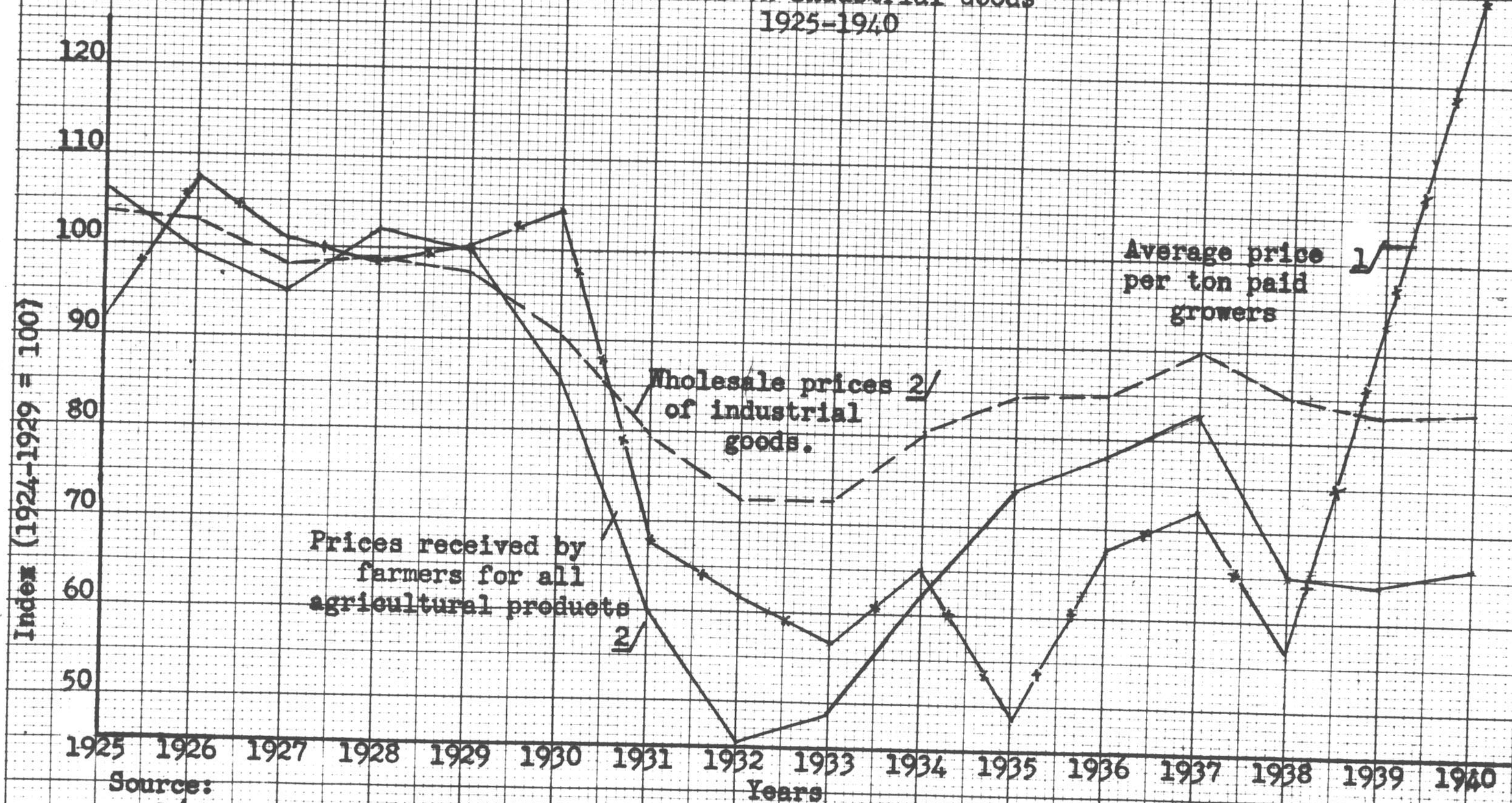
be the yield per acre, the percentage of long flax delivered to the plant, and the several costs and deductions for each plant. The prices growers receive for their crop are residual earnings of the processing plant rather than a definite contracted price.

Yields and percentage of long flax are relatively independent of economic conditions, but are definitely related to Oregon's weather and soil conditions. Twice during the past fifteen years yields have dropped from an average of 1.57 tons to the acre(Table 16) to less than a ton to the acre. This means a considerable decrease in fiber production and in growers' net returns. The percentage of No. 1 flax is also of special importance to the grower as well as to the processing plant. On three occasions during the past fifteen years--1931, 1935 and 1938--the percentage of long flax dropped to 37 percent or less. When the yield is low and the flax is short as in 1935 and 1938, the grower's net returns per acre are not enough to pay the cost of production. The effect on prices is shown in Figure 7.

An attempt is made in Figure 7 to relate the average price per ton received by growers for the fiber flax to the prices received by farmers for all agricultural products and the wholesale prices on industrial goods. The 1924-29 period equals 100 except that for flax the base period is from 1925 to 1929. In a previous comparison(Figure 3), there appears to be a definite correlation between industrial production and fiber-flax acreage, but the same relationship does not appear between prices on industrial goods and prices for flax fiber in Figure 7. The line representing the price paid growers for fiber flax resembles more closely the graph for prices on agricultural products. Both lines show abrupt and violent changes in comparison to the smoother and more stable trend for prices of industrial goods. Even though acreage trends may coincide with industrial production trends, the returns received by flax growers are definitely related to the prices for all agricultural products. Producers of agricultural products have been operating in a buyer's market for the past decade. The supply has kept ahead of demand and with keen competition farmers have been suffering from abnormally low prices. Industrial production decreased but prices on industrial goods remained relatively stable chiefly through restricted competition and the ability of industrial concerns to peg prices at a given level.

The upward surge in fiber-flax prices for 1938 as shown in Figure 7 represents a change from a buyer's market to a seller's market. An increase in demand and a decrease in supply have definitely established a seller's market for the flax grower and the processing plant.

Figure 7
Relationship of Prices Received by Flax Growers to Prices Received for All Agricultural Products by Farmers, and the Wholesale Prices on Industrial Goods 1925-1940



Source:
1/ Index of flax prices is based on prices paid by the State Flax Industry, 1925-29=100.
2/ 1941 Agricultural Charts, "Demand, Credit and Prices", Bureau of Agricultural Economics and Agricultural Marketing Service, United States Department of Agriculture.

Both conditions are directly related to the present war conditions.

Before the advent of the cooperatives in 1936, the State Flax Industry paid its growers on a cash-on-delivery basis for the pulled flax. The infant cooperatives did not have available the capital to pay cash on delivery; on the other hand they did not know how much they could pay until the processed crop was sold. The pooling plan adopted by the flax cooperatives as the pricing plan is common to other types of producer cooperative organizations. In order to stimulate the formation of cooperatives the State Flax Industry dropped its cash-on-delivery payment plan, and adopted the pooling plan. The change had to be made because some growers preferred to receive cash payments rather than to wait a year or more for their money, therefore they were not very good supporters of the cooperative movement. The State Flax Industry maintains a clause in the marketing contract whereby a grower may accept cash on delivery at the same price paid the cooperatives for their surplus flax. There have been no cash-on-delivery payments, however, for several years.

<u>The pooling plan</u>. The pooling plan connotes the mingling of products of equal grade during a definite period. The patron marketing through the pool ultimately receives his prorated share of the net income of his association. There

are several advantages of pooling. Primarily, pooling distributes price fluctuations and other risks over the whole product. Pooling also aids in expanding the market for the commodity by controlling the time, place, and methods of its sale. Another definite advantage is that the producer receives a benefit when the market rises during the selling season; when the market declines he takes his proportionate loss along with the rest of the patrons. The cooperative processing plants are indirectly financed by their grower-members who deliver their fiber flax to the association but are not paid until the flax fiber is sold. With respect to financing, the growers supplying the State Flax Industry have a decided advantage over those belonging to the cooperatives. Since it is a state-owned institution the growers are certain of receiving their money, and do not have to buy capital stock in order to deliver flax to the plant.

The success of the pooling arrangement is dependent on standard grades and grading of the product. On delivery to the processing plant the grower is paid an advance sum per ton for each grade of flax delivered. The amount of the advance to the grower is dependent on the anticipated price of fiber for the year. The advance sum paid a grower is subject to deductions for seed, any haulage charges that the processing plant might have accrued if forced to haul the flax to the plant, and occasionlly the amount due a credit agency on an assignment. An example of 1941 advance prices paid for pulled flax is as follows: $20 for No. 1 flax; $16 for No. 2 flax; and $8 to $12 for No. 3 flax.

Usually the grower receives about three payments before he receives final settlement for a particular crop. The second payment is not made until enough flax straw has been processed and the fiber sold to return a sum large enough to repay the borrowed money needed for the first payment and enough is left to make a satisfactory payment to the growers. This payment is made around the first of the new calendar year or perhaps as late as March, and it may be the final payment. Until the final payment is made the pool remains open. This means that the processing plant still has available for sale fiber or some other product from a particular crop. Pools are usually closed within a year and a half but occasionally remain open for three years or longer. This usually occurs when a plant contracts for more flax than can be processed within a year and must wait until the next season before processing and several months more before final sale is made. All payments are based on the graded percentages of No. 1, No. 2, and No. 3 grades of pulled flax delivered to the plant.

FACTORS AFFECTING COST

Processing costs have been the most important factor restricting the development of the fiber-flax industry in Oregon. Significant as the costs of processing are, there is no accurate cost information available that could be considered typical for processing plants in the Willamette Valley. There are several reasons for this. The cooperative processing plants have not as yet reached the stage of satisfactory record keeping and plant efficiency from which uniform cost records could be obtained. The data that are available from these sources are worthwhile only as comparisons, but not as criteria of efficiency for the industry. Published data on this subject have usually quoted the figures obtainable from the State Flax Industry. Although the State Flax Industry figures are accurate they do not apply under competitive labor conditions. The plant was established to provide labor for prison inmates. Consequently a great deal of additional hand labor is used in that plant that could not be used economically in a commercial plant of similar size. Weather conditions, efficiency of labor and management, grade and quality of flax straw, and general economic conditions are other factors that may result in highly variable cost data.

Another reason for the inadequate cost data is the complexity of the various processing operations. The main product desired is line fiber, but from almost every individual process a byproduct results that produces the problem of joint costs. The allocation of individual costs to each product is practically impossible. Rather than placing all the emphasis on line fiber as is done in most cost analyses, an alternate method of allocating the costs would be on a basis of the proportionate importance of each product to the whole. The determination and allocation of costs is a highly technical subject, however, and it is important enough to warrant a separate study. This discussion will deal with the various cost factors from a comparative viewpoint rather than a critical analysis of each cost factor and its relation to total costs.

Cost of Producing Fiber Flax

The cost of producing fiber flax in Oregon could very easily become a limiting factor in the progress of the industry, although it is seldom considered as important to the Oregon flax industry as processing costs. Should costs become so high that the growers' gross returns are below the cost of production and more promising alternative opportunities beckon, the processing plants might find themselves short of flax. Unfavorable climatic conditions, infestation by disease or insects, labor difficulties, and more lucrative incomes from other crops are all possibilities that might seriously affect the production of fiber flax. With a shortage of fiber flax the processing plants would be operating at larger unit costs which would be reflected in smaller unit returns to growers.

In a recent cost publication on fiber flax by G. W. Kuhlman and B. B. Robinson(7) the following production costs were given:

Table 17

Cost of Producing Fiber Flax in the
Willamette Valley, Oregon
Average of 2 years, 1934, 1936
(Based on a 2.1 ton per acre yield)

	Average Cost per acre	Average Cost per ton	Percentage total cost
			Per cent
Fertilizing	$0.52	$0.26	1.5
Preparing seedbed	4.06	1.96	11.1
Seed and sowing	5.05	2.44	13.9
Weeding	.95	.46	2.6
Preharvest costs	$10.58	$5.12	29.1
Pulling	$ 9.35	$4.53	25.7
Shocking, tying, & loading	1.94	.93	5.3
Hauling to storage shed	5.96	2.87	16.3
Harvest costs	$17.25	$8.33	47.3
Taxes on land	$ 1.85	$ .90	5.1
Interest on land at 5%	6.71	3.25	18.5
Use of land	$ 8.56	$4.15	23.6
TOTAL COST OF PRODUCTION	$36.39	$17.60	100.00

The 1934 and 1936 periods represent the average conditions during the depression period from 1930 to 1939, except that the yields of 2.1 tons per acre are high. The normal yield for that period was 1.61 tons per acre which would increase the average cost per ton to about $20 per ton. The cost is slightly below the $24.46 paid growers for a ton of pulled flax during that period(Table 16).

More than 50 percent of the total costs are cash, or out-of-pocket costs, principally harvesting costs, taxes, fertilizer, and perhaps some weeding. About 20 percent of the costs represent the farmer's own labor, and another 18.5 percent interest on investment in land and land taxes.

Actually about 20 percent of the harvest costs can be considered as marketing costs. A distinct division for statistical purposes between production and marketing, however, is almost impossible. Shocking and tying are operations of production but also part of the preparation of the flax for market. A possibility of reducing the cost operations appears to be in the pulling charges which account for over one-quarter of the total costs. Most of the farmers contract pulling of the flax to persons owning mechanical pulling machines for about $4 per ton. The introduction of the pulling machine has reduced the cost of harvesting tremendously, but there are possibilities of further reducing these costs. This might be done either through further perfection of the pulling machine or ownership of pulling machines by growers on a cooperative basis, or both. Costs for hauling are less than 16.3 percent at present and there is a possibility of further reducing this charge. The construction of cooperative flax plants has reduced the hauling distance by more than half.

The costs obtained in 1936 would hardly be applicable under present conditions, or if used to make comparisons during the 1925-30 period. All costs affecting production of fiber flax have advanced materially, especially labor which has risen by 30 percent since 1939. It is a safe estimate therefore to say that many costs have risen by 20 to 25 percent over the 1934-36 period when the cost study was made. In that case the present per acre cost would be about $45 and per ton cost about $25. Prices, however, have soared upward more rapidly than have costs. Present prices received by growers are higher by more than 50 percent than in the 1934-36 period.

Cost of Processing

Production of quality fiber flax requires chiefly favorable climatic and soil conditions, but other factors are of almost equal importance. The proper location of processing plants also requires certain prerequisite factors in order that the plants may be profitably operated. Cost factors in locating processing plants must be given careful consideration, being of importance equal to the prices received for the products. Production of fiber flax and the processing of fiber flax are interwoven, localized enterprises; each must be performed in proximity to the other for successful operation of either.

Factors to be considered in establishing processing plants. Many cost factors must be given thoughtful consideration in order to establish a successful processing plant. Some of these factors are discussed in the following pages.

Availability of raw material. It is highly apparent to the student of the flax industry that a processing plant cannot be operated profitably very far from the source of the pulled flax and the same applies to the production of fiber flax in relation to the nearness of processing plants. Fiber flax is bulky and has a very low value in relation to its weight, therefore, cannot bear high transportation charges. Production must of necessity be located near the processing plants or vice versa. Naturally, with higher prices for flax fiber the pulled flax can be profitably transported longer distances.

Capital. One of the most important factors limiting expansion of the fiber-flax industry in Oregon has been the unwillingness of the owners of capital to invest in the industry. The scarcity of capital for this purpose has caused increased costs in the form of higher interest rates and the processing inefficiencies attributable to uneconomic capital units have become an extremely vital factor. The construction of a processing plant with a 2,000 ton capacity requires about $40,000 to $65,000 with an additional $50,000 to $70,000 for working capital for the first two years. This investment must take place before any returns can be expected from sales. Sale of stock to growers and non-growers by a cooperative processing plant has proved unsatisfactory as a means of raising capital. Financiers do not consider the enterprise economical; besides, the industry is subject to outside hazards beyond their control. Banks are willing to loan money to the plants when sufficient security is evident. Flax-manufacturing plants have had as much or more difficulty in obtaining capital than have processing plants. Government capital is being made available in some instances, thus aiding in the progress of the industry. The lack of capital is definitely costly to the flax industry in Oregon. A young industry such as the flax industry in Oregon needs a flexible supply of capital or its progress will be thwarted.

Labor. Proportionately high labor costs account for the necessity of large amounts of liquid operating capital by the processing plants. A source of relatively cheap labor is a definite advantage to the processing plants. A scarcity of skilled labor has proved to be a particular disadvantage to the industry, because there are very few persons connected with the flax industry who can be qualified as flax experts, either in production or processing. At the beginning the flax-manufacturing plants were more handicapped because of the lack of skilled labor than were the processing plants. Gradually, however, the employees of both the flax-manufacturing plants and the processing plants are becoming more adept at handling flax, and the growers are becoming more efficient in producing flax. There are many persons who believe that before the flax industry can progress satisfactorily Belgian or Irish flax experts in retting and scutching and also in spinning will have to be imported. Retting is a fine art in itself. The flax must be removed from the tanks at a certain specific time or it may be underretted or overretted, and it takes experience to know when the flax has been retted to the degree desired. It appears that the processing plants have hurdled this problem, benefitting largely from the experience gained by the many years of processing by the State Flax Industry. Women predominate in the flax-manufacturing mills, whereas men are more common in the processing plants. The heavier work is done in the processing plants.

The Fair Labor Standards Act requires that the minimum wage of an employee in a flax-manufacturing mill shall not be less than 37½ cents per hour. The minimum wages in the processing plants are 40 to 50 cents per hour. This is an hourly wage increase of 10 to 15 cents an hour above the scale paid before the war emergency. As yet the workers are unorganized. This is advantageous to the processing plants that normally operate on a very narrow margin. The possibility should not be overlooked that should the processing industry expand to 10 or 15 plants labor organizers might find this industry an attractive field.

Labor costs account for more than 50 percent of the total costs of processing. In the foreign countries, which offer the greatest competition to Oregon fiber, more labor is required than is needed in the local plants, but on the other hand, the wage scale of the worker is much lower. In some of the foreign countries the average workman makes a smaller money wage in one day than average American workmen make in an hour. Since the supply and demand of foreign fiber ordinarily determines the price in the New York market, it is readily understood why local plants should be concerned in wage increases.

<u>Other factors</u>. There are other factors of importance in determining the location of processing plants, but those

mentioned already are perhaps of greatest importance. The factors that have not been considered are: (a) power, (b) water, (c) site, (d) transportation, (e) taxes, and (f) insurance.

Cost of power is one of the minor costs of the processing plant in the Willamette Valley, amounting to only 3 or 4 percent of the total cost. In other sections the power cost might be considerably higher and of greater importance. Power is needed to operate the scutching machine, lights, deseeding machine, and for pumping water to the retting tanks.

The site usually selected for a processing plant is one on higher ground, preferably on a gravelly soil to insure good drainage, located near good roads, accessible to a labor supply and also to a liberal supply of water. The water available in the Willamette Valley is especially desirable for retting because it is relatively free of mineral matter. It is also very desirable in washing and dyeing the yarn in the flax mills. The expenses of supplying water are minor, usually being limited to pumping charges.

The costs of transporting fiber are not of major importance because the bulk of the fiber is sold locally. If all the fiber had to be shipped to eastern markets the cost of shipping would be much more important, and the charges for brokerage would become highly significant.

Taxes and insurance should not be overlooked in considering plant location. The problem of taxes is a highly complex issue and no effort will be made to analyze the tax situation. It is interesting to note in passing that the real property of processing plants owned by the state is not subject to taxation and the insurance cost is low. This, therefore, minimizes two of the ordinary fixed costs of processing for these cooperatives. Flax fiber is an inflammable material. Processing plants are located in the country where adequate fire protection is usually not available; consequently, insurance rates are high.

<u>Costs of the cooperative processing plants</u>. It is readily apparent that several joint cost operations are involved in the numerous processes. The question arises as to how much of the costs should be charged to the seed and how much to fiber in the deseeding process. The same question can be asked as to the allocation of costs in the scutching process in which scutched tow and scutched fiber are produced. The usual procedure of the flax experts in handling such costs is to allocate all costs to the fiber after the revenue obtainable from the byproducts is deducted. Without a thorough cost study this is perhaps the most satisfactory method available, but it does not represent the true picture of costs unless the revenue obtainable from the byproducts is assumed to equal the costs of producing the byproducts. As will be brought out later in

this discussion, approximately 35 percent of a ton of pulled straw remains either as line fiber or as byproducts and the rest is lost as waste. Of the 35 percent only about eight percent is line fiber. On the other hand, for a ten year price average line fiber accounted for about 70 percent of the total revenue of the processing plants. This no doubt explains the reason for the method employed in the allocation of costs.

Another conspicuous fact made obvious in a brief review of the various processes is the great number of times that flax straw is handled before line fiber is finally produced. It is estimated by the flax experts that to load or unload a ton of flax straw costs approximately 50 cents per ton. If the flax is handled four times to perform each process, it would cost approximately $6 to $8 per ton for the entire process to perform the simple manual tasks of loading and unloading. Fortunately the costs are somewhat less than this because there is some application of the continuous motion principle. That is, some of the flax that is deseeded may go directly to the retting tanks and some that is dried may go directly to the scutching mill, which eliminates the rehandling in the storage sheds, thereby reducing the total number of times the bundles are handled. If the continuous motion principle could be instituted for all the flax, the labor costs for handling should be greatly reduced. Retting and drying preclude the possibility of the application of the principle because of the dependence of these processes on favorable weather conditions. Even so, it is possible that a careful study and analysis would reveal several possibilities of reducing costs by alternate methods of handling.

While on this subject it is opportune to discuss the policy of the cooperatives in contracting for more flax than can be readily processed in one season. The only advantage seems to be that the processing plants are assured of at least part of their next season's supply of raw material. There are several criticisms, however, of this practice that are discussed below.

The flax plants operate under a condition of decreasing costs, that is, when they are operating below capacity any additional increase toward capacity will lower the unit cost of processing. The fixed or overhead costs will be spread over a greater number of units. Beyond the optimum capacity, at which point the average costs of production are at a minimum, the costs of production would increase. The overhead costs would be smaller but the average variable costs would be larger because of the less efficient utilization of labor and materials under rush conditions. Having on hand more pulled flax than could be stored in the storage sheds would entail considerable loss from deterioration by the elements when stored outside. There would also be more handling required and the management would take greater chances in retting and drying the flax, thereby creating additional losses. Another drastic disadvantage which should not be overlooked is that there is a possibility that during the second season the price of fiber might drop, which means that all the growers who delivered flax to the plant would receive lower unit returns. Although this is equitable, the disconcerting fact is that the older members will have to accept lower returns because the management contracted for flax from newer members beyond the plant's annual capacity. Of course, this fact could be readily overlooked when prices are going up, but should it occur when the growers are operating near the margins it might have a different significance.

If a processing plant is considered as a distinct organization separate from the grower-members, a study will show that it occupies a peculiar and at times a precarious business position. In the first place the plant cannot readily switch to alternative processing or manufacturing enterprises. If forced to lie idle, many of the costs continue accruing. Someone is saddled with these accumulating costs. Secondly, a processing plant may find itself in a precarious situation because of the position it occupies between two immovable economic controls. The processing plant is caught between the growers on one side and foreign competition on the other. The growers demand a certain price per ton or they will refuse to grow flax. In order to pay the amount desired by the growers the plant must receive a desirable price for its fiber and other products. On the other hand, the processing plant must meet the prices established by foreign competition or not sell. If in the long run, prices received for fiber are not sufficient to meet the prices asked by growers and allow for costs of processing the plant has two alternatives. One is to discontinue operations; the other is to reduce costs in some manner so that the prices received will cover costs and yield the necessary returns to growers.

Analysis of actual processing costs. The simplest breakdown of processing costs is that of fixed or overhead costs, and variable costs. Expense items included in the overhead costs of a cooperative flax plant are: stationery and printing, office salaries, telephone and telegraph, depreciation, insurance, and interest paid. Depreciation, insurance, and interest paid are the largest fixed cost items. The records of one cooperative reveal that over a period of four years the overhead expense items varied from 15.5 percent to 19.7 percent. The records of another cooperative indicate that the overhead costs accounted for 33 percent of the total costs.

Variable costs include labor, light and power, social security taxes, state unemployment compensation, state industrial accident insurance, commissions, supplies, and miscellaneous items. Labor costs are by far the largest expenditure of a processing plant--in fact labor costs in one cooperative varied from 51 percent to 61 percent of the total costs over a four year period. Of the total variable costs the labor expense amounts to approximately 70 percent. Other important variable costs are power, commissions, and freight charges, each accounting for less than 5 percent of the total variable costs.

Three sets of figures are available on actual costs of processing. The first set of cost figures is for the State Flax Industry as of April 30, 1934. It is noted that the cost per ton of pulled flax was considered part of the costs of processing. Cooperatives do not consider costs of raw material as part of the costs of processing. These data for the State Flax Industry do not include operating costs, which the cooperatives must consider.

Average cost per ton of pulled flax		$19.41
Processing costs of one ton of pulled flax:		
Threshing	$3.90	
Retting	3.63	
Scutching	4.31	
Hackling	2.49	
Scutched Tow finished	1.60	
Total Cost processing		15.93
TOTAL COST		35.34
Less: Value of byproducts		11.00
Net cost of producing 152 lbs. of fiber		$24.34
Cost of producing one lb. of fiber		$ 0.16

Another set of figures is made available from a cooperative for the 1939 period. These figures follow:

Threshing	$2.13 per ton.	
Retting	4.29 " "	
Scutching	3.63 " "	
Hackling	3.28 " "	
Total processing costs		$13.33
Other operating costs		12.75
TOTAL COSTS per ton		$25.08
Net Cost of producing 125 pounds of fiber		$0.204

The foregoing figures do not allow for deduction of the value of byproducts. If an allowance of $11 were made for byproducts as was made in the previous cost statement, the cost per pound of fiber would be about 11 cents. Another factor to consider is that the 125 pounds of fiber produced by this cooperative is below the normal average. This cooperative processed only 676 tons of pulled flax in 1939--less than 50 percent of the plant's optimum capacity.

The other data available from a cooperative are not subdivided into the various costs as in the foregoing examples. The data, however, are in such form that several interesting figures were derived therefrom. It was found that the costs varied from $10 to $22 per ton of pulled straw processed. The costs were in an inverse ratio to the tonnage handled. In other words, with an increased tonnage a lower cost of processing was obtained. Approximately 2,000 tons of straw were processed by the cooperative at slightly over $10 per ton. This tonnage is near the cooperative's optimum capacity, so any substantial increase over this amount would probably increase the cost per ton. No data are available as to the average pounds of fiber obtained by the cooperative from a ton of straw for comparative per pound cost figures, but without doubt the cost per pound is very low. The total cost per pound for this cooperative is approximately half the cost experienced by the other cooperative. On the other hand the total tonnage processed is more than double, which automatically reduces the per unit costs. Both cooperatives have approximately the same plant capacity.

Progress in reduction of processing costs. Research workers interested in the possible reduction of high costs of processing are attacking the problem from two different angles. One group assumes that the general principles of processing now in vogue are the most satisfactory methods devised, and it is not their intention to revise these established principles. These research workers feel that the outlet for effecting a reduction in processing costs is in the reduction of labor charges by perfecting the several processes through increased or more efficient mechanization, and by close study of the various processes to determine where labor charges could be saved.

The other research group works on the assumption that the present system of processing is outmoded and the entire system needs to be revolutionized and established on a par with other modern industries. Their line of attack is to circumvent nature through increased mechanization with the hope of instituting the continuous motion principle to the flax industry. One of the ultimate effects would be a reduction of costs by eliminating the major share of the labor charges. This latter group hopes to effect the reduction in costs through application of the decortication principles of processing.

The research being done in Oregon is based primarily on the first theory. Considerable progress has already been made in the reduction of processing costs. A new deseeder was introduced in 1939 that cut deseeding costs approximately 50 cents per ton by eliminating two out of ten men and increasing the output per man.* The present endeavors are to develop a new scutching machine which would increase the output per man and also increase the output of line fiber by cutting down the amount of tow.

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* Information obtained from W. M. Hurst, Agricultural Engineer of the Bureau of Chemistry and Agricultural Engineering of the United States Department of Agriculture, stationed on the Oregon State Campus.

The fact that the present methods of processing are costly and laborious has stimulated interest in the development of the decortication process. In the decortication method the fiber is removed from the stem by a purely mechanical process. This differs from the present system in that retting is completely eliminated, however, chemical degumming is necessary to release the fibers. As yet the decortication method has not proven very satisfactory except for the coarser weaves because the fiber obtained is of poor spinning quality. There are several advantages to this method: (1) a larger portion of the whole fiber is saved and less tow results, (2) a larger crop can be processed and removed before the next crop is received, and (3) there is much less handling required, thereby lowering labor costs materially.

Considerable enthusiasm has been shown in the South for the revival again of flax production in that area based on the anticipated success of the decortication system of processing. Prior to the invention of Whitney's cotton gin, flax production was considerably more important in the South than was cotton production. Besides basing their hopes on the success of decortication they are going further in their experimentations by advocating the cottonization of flax. Cottonization involves the cutting of flax fibers into short staple lengths similar to cotton and spinning the short flax fibers on cotton machinery either alone or mixed with cotton.(2) They are claiming a future $13,000,000 flax crop in the South and a possible $18,000,000 linen industry. It would appear that the South is competing with itself for the already decreasing cotton markets. The textile trade does not forecast a huge success for the new enterprise.

The greatest enthusiasm for the new enterprise seems to be in Georgia where a research laboratory has been set up to study the possibilities of cottonizing flax. Experimentations were carried on for a three year period on production of fiber flax. The cost of production was $24.02 per acre(9), approximately 40 percent less than the costs per acre in Oregon during the same period, but the price received for fiber was only 7.3 cents per pound, or 60 percent less than the average ten year price received for all grades of fiber by Oregon plants. On the other hand, it is claimed that line fiber accounted for approximately 25 percent of a ton of straw when processed by the decortication method(9), whereas Oregon processing plants are fortunate to receive 7 or 8 percent of a ton of straw as fiber. The total returns for fiber from a ton of straw would be approximately the same for both processing methods. No cost figures, however, are available for the decortication process to make a price-cost analysis of the two processes possible.

It is reported that some of the European countries have made great strides in the perfection of the decortication and cottonization processes. In England, considerable use is supposedly being made of the poorer quality fibers from the decortication process in making many of the coarser weaves. The most advanced decorticating machines in Great Britain have never claimed more than 14 percent of line fiber from a ton of straw. The 25 percent of line fiber claimed in Georgia appears to be excessive in view of the foregoing statement.

Products manufactured by the processing plants. There are two methods in use by the flax industry by which the production of the several products may be indicated. The common method used by most of the processing plants places the emphasis on the average percent of weight lost for a particular process based on the amount of straw left from the previous process. For instance, the amount of scutched fiber that is left is based on the percent of weight of retted straw lost during the scutching process. A rough example of this method, assuming a 1 3/4 ton yield per acre, is as follows:

Pulled flax-------------	1 3/4 tons per acre.
Threshed flax-----------	About 26 percent loss of seed and chaff in threshing; about $1\frac{1}{4}$ tons remain.
Retted straw------------	About 20 percent of threshed straw lost in retting and drying; 1 ton remains.

Scutched fiber--------About 80 percent of retted straw (includes tow) is lost in scutching; about 400 pounds of fiber and tow remain of which approximately 250 pounds are fiber and 150 pounds are tow.

The second method is shown in Table 18. It is the easiest to comprehend and most popular with the students of the fiber-flax industry.

Table 18

Products Obtainable from One Ton of Pulled Flax*

Product	Pounds	% of Ton	% of Usable Products
Seed (6 bu. @ 56 lbs. per bu.)	336	16.8	42.8
Stockfood	140	7.0	17.8
Fiber	180	9.0	22.9
No. 1 Tow	12	0.6	1.5
No. 2 and 3 Tow	100	5.0	12.8
Pullings (Butts 7#; tips 10#)	17	0.85	2.2
Waste (shives, dust, etc.)	1215	60.75	----

*The figures are simple averages. The actual pounds and percentages vary considerably over a period of years, depending entirely on the crop.

Source: L. L. Laws, Manager of the State Flax Industry.

A ton of pulled straw free of weeds and dirt is the basis for the foregoing calculations. The quantity of products as listed is above average for all the processing plants. The amount of fiber produced in the cooperative flax plants seldom exceeds 160 pounds. The higher production of fiber at the state plant is due chiefly to the efficiency in handling and processing. The cooperatives are not equipped to produce stockfood so there would be a greater percentage classified as waste. It is safe to say that under present processing methods 60 to 65 percent of a ton of pulled straw is waste and the remainder is fiber or one of the byproducts. The principal product, fiber, accounts for only 7 to 9 percent of the 35 percent. Tow and fiber are produced in inverse relationship to each other. A large amount of fiber means a low production of tow. The high percentage of tow constitutes one of the most important internal problems of the processing industry in Oregon. As mentioned previously, this problem is being studied with the hope of perfecting a new scutcher to increase the fiber and reduce the amount of tow.

The data in Table 19 give some indication of the approximate comparative production of the various products in the several processing plants.

The percentage figures correspond very closely to the percentages given in Table 18. Table 19 indicates the importance of seed as a byproduct of fiber flax, not only as an item of income, but also as an item of expense of handling, cleaning, and warehousing. The data in Tables 18 and 19 show that a high percentage of tow is produced in relation to the amount of line fiber that is produced. Table 19 follows.

Table 19

Products Manufactured at the
State Flax Industry Plant,
1931-40.

Year	Fiber	Spinning Tow	Seed	Drug Meal	Stock-food	Pull-ings	Total*
	lbs.	lbs.	bu.	lbs.	lbs.	lbs.	lbs.
1931	584,111	417,966	60,160		992,000	47,688	5,410,715
1932	664,613	400,509	14,833	22,600	45,000	34,961	1,998,331
1933	621,912	254,387	7,016	25,000	135,000	32,943	1,462,138
1934	492,273	189,594	6,978	26,700	164,700	25,597	1,289,632
1935	551,592	296,834	23,489	36,500	278,000	23,959	2,502,269
1936	455,308	354,701	4,833	53,500	139,900	18,707	1,295,564
1937	195,464	225,702	18,630	39,400	293,200	8,188	1,805,234
1938	346,152	350,306	13,464	45,600	251,300	17,211	1,764,553
1939	238,235	213,256	4,594	12,300	112,570	9,308	842,933
1940	189,212	259,763	21,330	8,200	490,200	9,377	2,151,232
AVER-AGE	433,866	296,302	17,538	29,978	290,187	22,794	2,052,260
% of Total	21.1	14.4	47.8	1.5	14.1	1.1	100

* To obtain totals, percentages and averages, bushels of seed were converted to pounds of seed.

Source: State Flax Industry

Price-cost relationship in the industry. According to a recognized theory in economics when the marginal revenue exceeds marginal costs in an industry operating under conditions of pure or imperfect competition new firms will enter the industry until the marginal revenue and marginal costs are again equal. The industry will again be brought into equilibrium either through an increase in costs or a decrease in prices. The fiber-flax industry in Oregon today, December 1941, is in the described transition period changing from one equilibrium to another as new growers and processing plants are finding it exceedingly profitable to enter the industry. Costs are bound to rise while prices undoubtedly will drop after the war and a new equilibrium will again be attained. The question to be considered for the post-war future is whether the price-cost relationship will remain favorable for the maintenance of the flax industry in Oregon. A long-time unfavorable price-cost relationship could lead to the ultimate elimination of Oregon's entire flax industry.

The foregoing statements are based on the assumption that the methods of processing will remain the same. Here is a challenge to the ingenuity of the engineers and research workers interested in the development and progress of the fiber-flax industry.

BIBLIOGRAPHY

1. Brown, F. G. The increased interest in flax I. Textile Colorist. 63:745:9-12, Textile Colorist, Inc. New York, January 1941.

2. Brown, F. G. The increased interest in flax II. Textile Colorist. 63:746:90. Textile Colorist, Inc. New York, February 1941.

3. Evans, Robert B., and Monachino, Rose F. Trends in the consumption of fibers in the United States, 1892-1939. United States Department of Agriculture. Bureau of Agricultural Chemistry and Engineering. Southern Research Laboratory. New Orleans, April 1941.

4. Howard, Joe. Fiber flax grown in Oregon. Agricultural Journal. Oregon State College Agricultural Club. Corvallis, 8:2:5, March 1941.

5. Kampp, Aage H. Geography of the fiber flax industry. Economic Geography 15:2:165. Clark University, Worchester, Massachusetts, April 1939.

6. Kelly, John W. Kelly says. The Capital Journal. Salem, Oregon. 53rd year, No. 88., April 12, 1941.

7. Kuhlman, G. W. and Robinson, B. B. Cost and efficiency in fiber flax production in the Willamette Valley, Oregon. Oregon State Agricultural Experiment Station Bulletin No. 354. Corvallis. Oregon State System of Higher Education. June 1938.

8. Lomax, A. L., and Van Guilder, T. Marketing and manufacturing factors in Oregon's flax industry. University of Oregon Studies in Business No. 8, Business Administration Series 2:1, University of Oregon, Eugene, December 1930.

9. McGraw-Hill Publishing Company. Flax may be cotton kingdom's ally. Business Week., No. 580. page 54. New York, October 12, 1940.

10. Powers, W. L. Soil, nutrient and irrigation requirements of fiber flax. Station circular of information No. 238., Oregon Agricultural Experiment Station. Corvallis, March 26, 1941.

11. Robinson, B. B. Fiber flax in Oregon. Station Circular 118. Oregon Agricultural Experiment Station. Corvallis, May 1936.

12. Robinson, B. B. Flax-fiber production. Farmers Bulletin No. 1728. United States Department of Agriculture. Washington, United States Government printing office. Revised July 1940.

13. United States Congress. Tariff Readjustment, 1929. Flax, hemp, jute and manufactures of. Schedule 10, Volume X. Hearings before the Committee on Ways and Means, House of Representatives, Seventieth Congress, Second session. Washington, United States Government printing office. 1929

14. Wharton, Don. The crop that came back. Country Gentleman. 111:4:7, Curtis Publishing Company, Philadelphia, April 1941.

15. Works Progress Administration. Flax in Oregon. Bedell Building, Portland, Oregon. Revised and reprinted June, 1939.

16. Wright, C. W. Division of grain inspection report. Oregon State Department of Agriculture Biennial Report. page 80. Salem, Oregon. State printing department. July 1, 1938 to June 30, 1940.

APPENDIX A

Sample Flax Growing Agreement

FLAX GROWING AGREEMENT — SEASON OF 194........

IT IS HEREBY AGREED, by and between ....

of ...., County of .... State of ....,

who is hereinafter referred to as the Grower, and ....,
a Growers Cooperative Association which is hereinafter referred to as the Association, as follows:

The Grower agrees to prepare the seed bed and to plant in a good husbandlike manner, during the season of 194........,

.... acres of fiber flax on the following described land in .... County, State of Oregon, being

located in Section ...., Township ...., Range .... W. M.

The Grower agrees that the seed used shall be only that furnished by the Association, the price of which shall be \$2.50 per bu. The Association shall furnish such seed to the Grower at its plant prior to seeding time; and the Grower agrees to seed not less than eighty (80) pounds to the acre. All seed furnished by the Association shall constitute an advance to the Grower to be repaid and accounted for in the first settlement made for flax sales, unless sooner paid by the grower. The Grower agrees to seed such flax as early as weather and condition of the soil permits and not later than May 15th, of this season.

The Grower agrees to harvest said flax at the time and in the particular manner directed by the Association. The Association may elect, prior to harvest, to have the flax pulled, cut with a mower, or harvested with a binder and bound, shocked, and cured in the field, all to be done as directed by the Association.

The Grower agrees to seed flax on land well drained and otherwise suitable for flax production, and not to use any land unsuited, or to plant on land where flax was grown the three immediately preceeding seasons.

The Flax shall be harvested when dry and only during dry weather; in a manner to preserve the flax in good condition until the same is delivered to the Association.

The Association shall not be required to accept, nor market, any flax not seeded, harvested, or cared for in accordance with the terms hereof. The Grower agrees to haul and to deliver, in good condition, said flax to the Association at its plant

at ...., when and as directed by the Association.

The Association agrees to take all flax not later than Sept. 10, 194........ The Grower shall use all reasonable care to prevent loss or damage to said crop, both before and after harvest. Seed from the crop is included in the flax to be delivered; the Grower will use ordinary care under usual farming practices, as applicable to flax culture, in handling the crop so that as much as possible of the seed will be delivered as part thereof.

It is expressly stipulated that whereas the Association is a Growers Cooperative and handles the products of its members as such that the Grower will and shall be paid for the product delivered under and in accordance with the by-laws and articles of said Association.

The following shall be the schedule of Liquidated Damages: (1) For all seed purchased without the consent or approval of the Association \$2.50 per bushel. (2) For any and all flax produced by the Grower and retained by him or sold elsewhere than to the Association, without the consent or approval of the Association, \$15.00 per ton of flax in the field. And in the absence of proof as to the actual quantity of flax the Grower sold and/or delivered elsewhere than the Association, the amount of damage shall be determined on the basis of two tons per acre of ground seeded to flax by the Grower.

The Grower hereby appoints the said Association as his agent for the purpose of processing and marketing the crop produced by him and delivered to the Association.

The Association on its part agrees to make payments to the Grower, from time to time, on account as sales are made and to well and truly account to the Grower for the full net returns from such product and to the same extent as every other member receives from flax of like grade and quality. The Association shall deduct the costs and expenses by it incurred in processing or marketing the flax produced and delivered by the Grower; and shall have the right to process in its own plants such portion of said crop as may be found to be expedient and to the best interests of the Association in behalf of its entire membership and in the successful operations of its plant and for the purpose of securing and holding the market for such products.

If the Grower fails or refuses to harvest and secure such crop as and when directed by the Association, it may, in addition to any and all other rights it may have hereunder, at its option enter upon said premises and harvest and secure said crop and charge the costs thereof to the Grower as an advance payment on such crop.

If the Grower fails to make delivery promptly on demand, the Association may have the flax hauled and charge the actual cost of such hauling to the Grower and deduct such charges from any sums due the Grower for such crop; and if no sum is due to the Grower at the time of final settlement for the season's out-put, then the Grower shall pay the such charges, or balance unpaid thereof, to the Association on demand thereof.

The Association shall have the right to enter upon said premises at any time, without doing damage to any crop, for the purpose of inspecting the crop and directing the gathering thereof as herein stipulated.

The Grower agrees not to assign this agreement without the written consent of the Association.

In the event of any governmental regulations affecting any of the provisions of this contract or imposing any restriction on the out-put of the Association it reserves the right to modify or amend the provisions hereof to reflect or to set off any such law or regulation.

It is agreed that the amount charged for seed furnished and any other amounts charged for harvesting, securing or hauling such crop, as well as all advances and payments made by the Association to the Grower, or in his behalf, shall be considered and shall constitute a first lien upon the crop. To secure the payment thereof the Grower hereby mortgages and conveys to the Association all flax grown hereunder, and if default is made in the delivery thereof, or if the Grower does not take proper care of said crop, or if at any time the Association shall deem itself insecure, it may enter upon said premises and take possession of said flax wherever the same may be and to sell the same at public or private sale, either in the form in which it then is or by the exercise of its right as the Gower's agent to process and market the same, by giving notice of its intention to so sell the same by publication of such notice for one week in some newspaper published in the county where the flax was grown and produced and from the proceeds of such sale to repay itself for any and all advances made to the Grower, with the costs of the sale and any expenses by it incurred in the harvesting, securing, hauling, and/or marketing the same; and to account to the Grower for any net proceeds as elsewhere herein provided.

The Grower hereby affirms that he has given no mortgage to any person on said crop and that no person has any lien thereon or claim thereto, except as shown on this contract.

(a) Chattel mortgage to .... for the sum of \$..........................

(b) .... has an interest in the crop referred to and his interest is .... share of the crop produced.

It is expressly stipulated that all of the terms of this contract are contained herein; where reference is made to the membership agreement between the Grower and the Association such membership is hereby made a part hereof. No agent of the Association has any authority to waive or to modify any of the terms hereof, except by order of the Board of Directors notice of which must be attested by the Officers of the Association.

The Grower acknowledges that at the time of making this agreement that he received a duplicate thereof.

The parties hereto shall have and are given the option to cancel this agreement, or to reduce the acreage herein specified by giving a written notice to the other party not later than February 1st, 194........

...., Grower.

...., Association.

APPENDIX B

Imports of raw flax products
into the United States,
1931-1940

FLAX——HACKLED
INCLUDING "DRESSED LINE"*

	1931	1932	1933	1934	1935
Full Duty Imports:					
Rate of duty	$67.20 ton	$67.20 ton	$67.20 ton	$67.20 ton	$67.20 ton
Calculated duty	$34,742	$36,490	$46,368	$68,611	$83,731
Equivalent ad valorem	13%	14%	11%	10%	10%

Country	1931 Tons	1931 % of Tot. Tons	1931 Value $	1932 Tons	1932 % of Tot. Tons	1932 Value $	1933 Tons	1933 % of Tot. Tons	1933 Value $	1934 Tons	1934 % of Tot. Tons	1934 Value $	1935 Tons	1935 % of Tot. Tons	1935 Value $
Total(full duty)	517		265,147	543		253,869	690		425,329	1021		678,405	1246		877,868
value per ton			512.85			467.53			616.42			664.45			704.55
value per lb.			.23			.21			.28			.30			.31
BELGIUM	20	4	8,221	6	1	2,306	24	4	8,579	2	.2	564	7	.6	5,165
value per ton			411.05			384.33			357.46			282.00			736.86
value per lb.			.18			.17			.16			.13			.33
FRANCE	81	16	21,432	86	16	22,916	20	3	15,549	14	1	5,267	-	—	—
value per ton			264.59			266.47			777.45			376.21			—
value per lb.			.12			.12			.35			.17			-
U.S.S.R.(Europe)	-	—	—	54	10	13,033	123	18	32,355	258	25	95,608	338	27	171,586
value per ton			—			241.35			263.05			270.57		1/	507.67
value per lb.			-			.11			.16			.17			.23
UNITED KINGDOM	298	58	185,456	365	67	200,002	489	71	347,828	722	71	561,152	824	66	653,230
value per ton			622.33			547.95			711.30			777.30			792.75
value per lb.			.28			.24			.33			.35			.35

All references are explained on the last page.

(Continued on page 152)

FLAX---HACKLED
INCLUDING "DRESSED LINE"*

(Continued from page 151)

	1936	1937	1938	1939	1940
Full Duty Imports:					
Rate of duty	$67.20 ton	$67.20 ton	$67.20 ton	$33.60 ton 2/	$33.60 ton
Calculated duty	$81,178	$80,842	$38,573	$42,806	
Equivalent ad valorem	8.6%	8.4%	7.8%	3.9%	

Country	1936 Tons	1936 % of Tot. Tons	1936 Value $	1937 Tons	1937 % of Tot. Tons	1937 Value $	1938 Tons	1938 % of Tot. Tons	1938 Value $	1939 Tons	1939 % of Tot. Tons	1939 Value $	1940 Tons	1940 % of Tot. Tons	1940 Value $
Total(full duty)	1208		947,362	1203		962,053	574		496,557	1274		1,097,227	402		554,738
value per ton			784.24			799.71			865.08			861.24			1,379.94
value per lb.			.35			.36			.39			.38			.62
BELGIUM	12	1	9,130	64	5	42,810	9	2	7,294	76	6	60,386	-	--	---
value per ton			760.83			668.90			810.44			794.55			--
value per lb.			.34			.30			.36			.35			-
NETHERLANDS	47	4	28,016	90	7	57,988	47	8	33,270	176	14	131,673	-	--	---
value per ton			596.08			644.31			707.87			748.14			--
value per lb.			.27			.29			.32			.33			-
U.S.S.R.(Europe)	164	14	71,774	250	21	119,540	-	--	---	-	--	---	-	--	---
value per ton			437.64			478.16			--			--			--
value per lb.			.20			.21			-			-			-
UNITED KINGDOM	985	81	838,442	786	65	737,369	516	89	454,662	1021	80	904,575	-	--	---
value per ton			851.21			938.13			881.13			885.97			--
value per lb.			.38			.42			.39			.40			-

FLAX---NOT HACKLED*

	1931			1932			1933			1934			1935		
Full Duty Imports:															
Rate of duty	$33.60 ton			$33.60 ton			$33.60 ton			$33.60 ton			$33.60 ton 3/		
Calculated duty	$41,261			$75,835			$73,450			$78,658			$19,891		
Equivalent ad valorem	16%			18%			12%			10%			7%		
Country	Tons	% of Tot. Tons	Value $	Tons	% of Tot. Tons	Value $	Tons	% of Tot. Tons	Value $	Tons	% of Tot. Tons	Value $	Tons	% of Tot. Tons	Value $
Total(full duty)	1228		253,012	2257		418,519	2186		586,567	2341		818,022	2118		998,353
value per ton			207.66			185.43			268.33			349.43			471.36
value per lb.			.09			.08			.12			.16			.21
BELGIUM	358	29	92,766	65	3	20,194	663	30	227,141	1129	48	471,593	1058	50	499,358
value per ton			259.12			310.68			342.60			417.70			471.98
value per lb.			.12			.14			.15			.19			.21
FRANCE	35	3	10,595	363	16	65,026	253	12	65,402	161	7	71,053	221	10	104,046
value per ton			302.71			179.13			258.50			441.33			470.79
value per lb.			.14			.08			.12			.20			.21
U.S.S.R.(Europe)	-	---	----	204	9	30,342	1261	58	292,040	902	39	230,726	469	22	229,423
value per ton			---			148.74			231.60			255.79	1/		489.17
value per lb.			-			.07			.10			.11			.22
UNITED KINGDOM	-	---	----	20	1	4,288	-	---	----	-	---	----	209	10	92,789
value per ton			---			214.40			---			---			443.97
value per lb.			-			.10			-			-			.20

(Continued on page154)

FLAX---NOT HACKLED*
(Valued at $340 per ton or more) 4/

(Continued from page 153)

	1936	1937	1938	1939	1940
Full Duty Imports:					
Rate of duty	$22.40 ton	$22.40 ton	$22.40 ton	$22.40 ton	$22.40 ton
Calculated duty	$54,230	$61,600	$10,013	$52,416	—
Equivalent ad valorem	4.8%	4.7%	4.2%	4.1%	-

Country	1936 Tons	1936 % of Tot. Tons	1936 Value $	1937 Tons	1937 % of Tot. Tons	1937 Value $	1938 Tons	1938 % of Tot. Tons	1938 Value $	1939 Tons	1939 % of Tot. Tons	1939 Value $	1940 Tons	1940 % of Tot. Tons	1940 Value $
Total(full duty)	2421		1,125,824	2750		1,314,527	447		238,205	2340		1,268,806	3908		1,619,863
value per ton			465.02			478.00			532.90			542.22	5/		5/
value per lb.			.21			.21			.24			.24			
BELGIUM	-	—	—	1427	52	743,298	339	76	187,617	1995	85	1,098,824	-	—	—
value per ton			—			520.88			553.44			550.79			—
value per lb.			-			.23			.25			.25			-
NETHERLANDS	-	—	—	240	9	112,241	101	23	47,605	268	11	131,055	-	—	—
value per ton			—			467.67			471.34			489.01			—
value per lb.			-			.21			.21			.22			-
U.S.S.R.	1019	42	470,297	315	11	145,315	-	—	—	-	—	—	-	—	—
value per ton			461.53			461.32			—			—			—
value per lb.			.21			.21			-			-			-
UNITED KINGDOM	-	—	—	-	—	—	-	—	—	44	2	20,441	-	—	—
value per ton			—			—			—			464.57			—
value per lb.			-			-			-			.21			-

FLAX---NOILS*

	1931	1932	1933	1934	1935
Full Duty Imports:					
Rate of duty	$22.40 ton	$22.40 ton	$22.40 ton	$22.40 ton	$22.40 ton
Calculated duty	$650	$224	$4,010	$6,541	$8,602
Equivalent ad valorem	28%	30%	20%	18%	14%

Country	1931 Tons	1931 % of Tot. Tons	1931 Value $	1932 Tons	1932 % of Tot. Tons	1932 Value $	1933 Tons	1933 % of Tot. Tons	1933 Value $	1934 Tons	1934 % of Tot. Tons	1934 Value $	1935 Tons	1935 % of Tot. Tons	1935 Value $
Total(full duty)	29		2,345	10		749	179		20,073	292		36,128	384		61,589
value per ton			80.86			74.90			112.14			123.73			160.39
value per lb.			.04			.03			.05			.06			.07
BELGIUM	14	48	1,019	½		54	91	51	10,705	119	41	13,240	135	35	22,155
value per ton			72.78			—			117.64			111.26			164.11
value per lb.			.03			-			.05			.05			.07
FRANCE	-	—	—	-	—	—	-	—	—	1	.5	99	38	10	4,458
value per ton			—			—			—			99.00			117.32
value per lb.			-			-			-			.04			.05
U.S.S.R.(Europe)	-	—	—	-	—	—	-	—	—	-	—	—	-	—	—
value per ton			—			—			—			—			—
value per lb.			-			-			-			-			-
UNITED KINGDOM	15	52	1,326	10	100	695	88	49	9,349	172	59	22,789	211	55	34,952
value per ton			88.40			69.50			106.24			132.49			165.64
value per lb.			.04			.03			.05			.06			.07

(Continued on page 156)

FLAX----NOILS*

(Continued from page 155)

	1936	1937	1938	1939	1940
Full Duty Imports:					
Rate of duty	$22.40 ton	$22.40 ton	$22.40 ton	$11.20 ton 6/	$11.20 ton
Calculated duty	$11,178	$18,122	$1,389	$21,986	—
Equivalent ad valorem	14.8%	12.0%	10.7%	9.8%	-

Country	1936 Tons	1936 % of Tot. Tons	1936 Value $	1937 Tons	1937 % of Tot. Tons	1937 Value $	1938 Tons	1938 % of Tot. Tons	1938 Value $	1939 Tons	1939 % of Tot. Tons	1939 Value $	1940 Tons	1940 % of Tot. Tons	1940 Value $
Total(full duty)	499		75,654	809		150,599	62		12,930	1963		223,474	-	—	—
value per ton			151.61			186.15			208.55			113.84			—
value per lb.			.07			.08			.09			.05			-
BELGIUM	98	20	17,866	386	48	72,229	28	45	7,051	475	24	52,486	-	—	—
value per ton			182.30			187.12			251.82			110.50			—
value per lb.			.08			.08			.11			.05			-
NETHERLANDS	14	3	3,341	-	—	31.00	-	—	—	-	—	—	-	—	—
value per ton			238.64			—			—			—			—
value per lb.			.11			-			-			-			-
U.S.S.R.	-	—	—	61	8	9,570	11	18	1,198	1373	70	153,883	-	—	—
value per ton			—			156.88			108.90			112.08			—
value per lb.			-			.07			.05			.05			-
UNITED KINGDOM	120	24	23,590	192	24	41,986	23	37	4,681	115	6	17,105	-	—	—
value per ton			196.58			218.68			203.52			148.74			—
value per lb.			.09			.10			.09			.07			-

FLAX---TON*

	1931	1932	1933	1934	1935
Full Duty Imports:					
Rate of duty	$22.40 ton	$22.40 ton	$22.40 ton	$22.40 ton	$22.40 ton
Calculated duty	$25,312	$11,670	$30,934	$20,070	$28,470
Equivalent ad valorem	16%	14%	12%	11%	5%

Country	1931 Tons	1931 % of Tot. Tons	1931 Value $	1932 Tons	1932 % of Tot. Tons	1932 Value $	1933 Tons	1933 % of Tot. Tons	1933 Value $	1934 Tons	1934 % of Tot. Tons	1934 Value $	1935 Tons	1935 % of Tot. Tons	1935 Value $
Total(full duty)	1130		157,906	521		83,533	1381		255,664	896		180,109	1271		531,290
value per ton			139.74			160.33			183.68			201.01			418.00
value per lb.			.06			.07			.08			.09			.19
BELGIUM	55	5	6,095	5	1	1,223	59	4	11,279	22	2	4,373	28	2	12,879
value per ton			110.81			24.46			191.16			198.77			246.70
value per lb.			.05			.01			.09			.09			.21
FRANCE	37	3	6,275	292	56	44,847	-	---	---	64	7	10,990	10	1	2,467
value per ton			169.60			153.59			---			171.72			246.70
value per lb.			.08			.07			-			.08			.11
U.S.S.R.(Europe)	-	---	---	-	---	---	1270	92	226,380	631	70	125,059	1002	79	426,101
value per ton			---			---			178.25			198.19			425.25
value per lb.			-			-			.08			.09	1/		.19
UNITED KINGDOM	121	11	19,387	21	4	4,422	52	4	16,005	170	19	37,485	168	13	63,329
value per ton			160.22			210.57			307.78			222.62			376.96
value per lb.			.07			.09			.14			.10			.17

(Continued on page 158)

FLAX---TOW*

(Continued from page 157)

	1936	1937	1938	1939		1940
Full Duty Imports:						
Rate of duty	$22.40 ton	$22.40 ton	$22.40 ton	$11.20 ton	6/	$11.20 ton
Calculated duty	$28,941	$24,192	$1,008	$2,184		—
Equivalent ad valorem	9.0%	9.3%	7.7%	3.0%		-

Country	1936 Tons	1936 % of Tot. Tons	1936 Value $	1937 Tons	1937 % of Tot. Tons	1937 Value $	1938 Tons	1938 % of Tot. Tons	1938 Value $	1939 Tons	1939 % of Tot. Tons	1939 Value $	1940 Tons	1940 % of Tot. Tons	1940 Value $
Total(full duty)	1292		322,759	1080		259,431	45		13,168	195		72,722	-	—	—
value per ton			249.81			240.21			292.62			372.93			—
value per lb.			.11			.11			.13			.17			-
BELGIUM	79	6	26,283	16	2	6,173	11	24	3,967	37	19	13,348	-	—	—
value per ton			332.70			385.81			360.64			360.76			—
value per lb.			.15			.17			.16			.16			-
NETHERLANDS	15	1	6,640	30	3	14,291	-	—	—	36	18	13,085	-	—	—
value per ton			442.67			476.36			—			363.47			—
value per lb.			.20			.21			-			.16			-
U.S.S.R.	-	—	—	628	58	92,045	14	31	1,776	1	1	204	-	—	—
value per ton			—			146.57			126.86			204			—
value per lb.			-			.07			.06			.08			-
UNITED KINGDOM	112	9	40,436	117	11	42,605	9	20	3,477	53	27	20,888	-	—	—
value per ton			361.04			364.14			386.33			394.11			—
value per lb.			.16			.16			.17			.18			-

FLAX---STRAW*

	1931	1932	1933	1934	1935
Full Duty Imports:					
Rate of duty	$3.00 ton	$3.00 ton	$3.00 ton	$3.00 ton	$3.00 ton
Calculated duty	$624	$582	$738	$96	$60
Equivalent ad valorem	7%	9%	10%	7%	7%

Country	1931 Tons	1931 % of Tot. Tons	1931 Value $	1932 Tons	1932 % of Tot. Tons	1932 Value $	1933 Tons	1933 % of Tot. Tons	1933 Value $	1934 Tons	1934 % of Tot. Tons	1934 Value $	1935 Tons	1935 % of Tot. Tons	1935 Value $
Total(full duty)	208		8,995	194		6,481	246		7,485	32		1,393	20		819
value per ton			43.25			33.41			30.43			43.53			40.95
value per lb.			.02			.015			.013			.02			.018

(Canada supplied practically all the straw imported into the U.S. during this period.)

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FLAX---STRAW*

(Continued from page 159)

	1936	1937	1938	1939	1940
Full Duty Imports:					
Rate of duty	$3.00 ton	$3.00 ton	$3.00 ton	$1.50 ton 7/	$1.50 ton
Calculated duty	$522	$702	$354	$109.50	---
Equivalent ad valorem	6.8%	6.4%	6.8%	3.5%	-

Country	1936 Tons	1936 % of Tot. Tons	1936 Value $	1937 Tons	1937 % of Tot. Tons	1937 Value $	1938 Tons	1938 % of Tot. Tons	1938 Value $	1939 Tons	1939 % of Tot. Tons	1939 Value $	1940 Tons	1940 % of Tot. Tons	1940 Value $
Total(full duty)	174		7,668	234		10,985	118		5,203	73		3,159	-	---	----
value per ton			44.06			46.94			44.09			43.27			---
value per lb.			.019			.021			.02			.019			-

(Canada has supplied all the straw imported into the U. S. during this period.)

* Ton of 2240 lbs.

1/ U.S.S.R.(Europe and Asia).

2/ The tariff rate was changed as of January 1, 1939 as a result of reciprocal trade treaties with the United Kingdom.

3/ Figures apply from January 1-April 30; from May 1-December 31 the rate of duty was lowered to $22.40 per ton, the calculated duty amounted to $34,182 and equivalent ad valorem was 5%.

4/ Flax valued at less than $340 per ton was imported almost entirely from Poland-Danzig as follows:

1936---27 tons valued at $9,013; rate of duty $33.60; calculated duty $907; ad valorem 10.1%.
1937---65 tons valued at $20,568; rate of duty $33.60; calculated duty $2,184; ad valorem 10.6%.
1938---5 tons valued at $1,234; rate of duty $33.60; calculated duty $168; ad valorem 13.6%.
1939---70 tons valued at $22,042; rate of duty changed to $16.80 per ton, result of reciprocal trade treaty with United Kingdom.

5/ These figures are for all other flax except the hackled flax that was imported; the breakdown into tow; noils; not hackled, is not known.

6/ The rate of duty was changed to $\frac{1}{8}$ cent per lb. under the reciprocal trade treaty with the United Kingdom as of January 1, 1939.

7/ The rate of duty was changed to $1.50 per ton under the reciprocal trade treaty with Canada effective January 1, 1939.