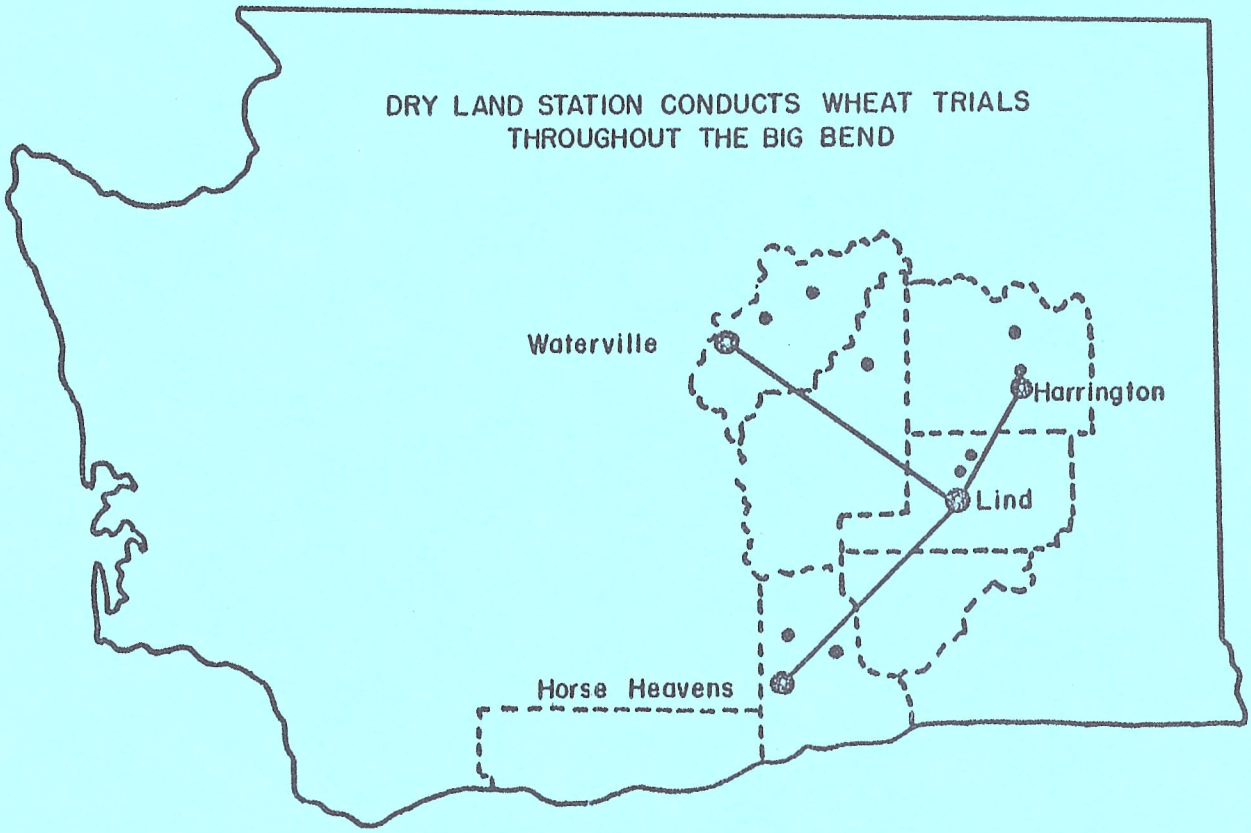
41st ANNUAL

FIELD DAY

DRY LAND EXPERIMENT STATION



LIND, WASHINGTON
JUNE 27, 1957

Washington Agricultural Experiment Stations, Institute of Agricultural Sciences, State College of Washington

INTRODUCTION

The Dry Land Experiment Station, formerly the Adams Branch Experiment Station, was established in 1910 near Ritzville, when a 10-acre plot of land was leased and experiments with cereals, forage crops, and soils commenced. Largely through the efforts of Spokane businessmen, the Milwaukee Railroad, and Adams County, a site was leased from Adams County approximately 3 miles northeast of Lind. Buildings were erected, and the Station moved to its present location in 1915.

Originally, the Station was operated with county, USDA, and state funds. At present it is supported entirely by state funds. The farm consists of 320 acres of land, of which approximately 260 acres are devoted to crop production experiments. The remainder consists of grass and rough land.

Early in 1949, Adams County deeded 2.06 acres to the Board of Regents of the State College of Washington. There the new state-financed office and greenhouse buildings were constructed. Under the leadership of the Washington Agricultural Experiment Stations, the Dry Land Experiment Station has carried out a continous program of research since its establishment.

Experiments are planned and conducted cooperatively with the different departments of the Main Experiment Station at Pullman; Soil Conservation Service and Bureau of Plant Industry, USDA; and with the U. S. Weather Bureau, Department of Commerce.

The Field day is an annual affair held in June to acquaint farmers, ranchers, and townspeople of central Washington with the work being conducted and to furnish information collected from the experiments in progress. The public is especially invited to attend these field days, although visitors are welcome at all times.

Walter L. Nelson, Superintendent

CLIMATIC INFORMATION

Table 1 gives the annual rainfall near Lind for the past 55 years. The data collected for the last 35 years at the Station average 6 inches of rain between October 1 and March 21; 2.5 inches from April 1 through June 30, and 1 inch from July 1 to September 30. Approximately 90% of the rainfall is between October 1 and June 30, a period which coincides almost exactly with normal winter wheat growing season.

Climatic measurements are made daily. They consist of readings made with such standard U. S. Weather Bureau instruments as maximum and minimum thermometers, a manual precipitation gauge, sling psychrometer, and evaporation instruments. In addition, a continuous record of soil and air temperatures, relative humidity, and precipitation is kept by automatic recording instruments.

RESEARCH ON CEREAL CROPS

In 1950, the Dry Land Experiment Station enlarged the cereal breeding and testing program. The object of this program is to produce new varieties of cereals adapted to the Big Bend area where annual rainfall is from 9 to 13 inches. This program includes the testing of new varieties and selections developed at other experiment stations throughout the Midwest and Pacific Northwest, and breeding of new varieties. Actual breeding and selection are done on the station. Final testing is done at locations listed below.

Three new testing sites were set up in 1950 to adequately check cereal varietal response throughout the Big Bend. These sites are: Bill Schmidtman farm, Waterville; Leonard Schultz farm, Harrington; and Vollmer & Bayne, Prosser. All experimental work at the outlying locations is conducted by the same methods as the work at the Station. Fifty to sixty varieties and new selections from breeding nurseries are tested at these locations.

In addition to the locations mentioned above, small variety trials are conducted on the following farms: Ed Tyacke in Benton County; Phil Wainscott and Ted Cornehl in Douglas County; Oscar McCoy in Grant County; and L. H. Bowman, Davenport. From ten to fifteen varieties each of winter and spring wheat are grown at most of these locations. Varieties included in these small trials are standard varieties and new selections being considered for possible release. Farmers in these areas are urged to visit the plots on county tours or at any other time. The results of these small trials and larger testing areas with the trials at the Station will determine the value of any new selection for the Big Bend area.

WINTER WHEAT

Table 2 shows the yields of standard varieties of white winter and hard red winter grown at Lind. The white club winter-wheat varieties consistently yield higher then either Rio or Turkey. Although Elmar, Elgin, and Omar are higher yielding, these varieties have not been recommended because of poor quality. When grown under dry conditions of the Big Bend, these varieties tend to produce high-protein wheat. At protein above 9 per cent, the flour does not make good pastry and is unsuitable for bread. With the exception of Hymar, all of the white winter wheat varieties are less winter hardy then Rio. Rex is discounted because of poor milling quality. Rex has been a consistently poor yielder in this area and has been dropped from the testing program.

Table 1. Annual Rainfall near Lind, Washington, 1897-1957

Data obtained by Dan Krehbiel		Data obtained by O. W. Goodenough		Data obtained by the Dry Land Experiment Station			
1897-98	6.34	1909-10	8.74	1916-17	7.60	1935-36	8.09
1898-99	8.76	1910-11	8.10	1917-18	6.64	1936-37	8.93
1899-00	12.00	1911-12	10.33	1918-19	8.10	1937-38	11.89
1900-01	15.34	1912-13	8.24	1919-20	6.56	1938-39	5.32
1901-02	12.33	1913-14	10.50	1920-21	7.01	1939-40	13.01
1902-03	13.67	1914-15	10.54	1921-22	6.97	1940-41	18.00
1903-04	15.03	1915-16	13.59	1922-23	10.90	1941-42	12.29
1904-05	11.34			1923-24	6.62	1942-43	11.65
1905-16	12.01			1924-25	8.32	1943-44	8.60
				1925-26	6.65	1944-45	10.65
				1926-27	12.65	1945-46	11.82
				1927-28	10.83	1946-47	8.02
				1928-29	5.77	1947-48	22.71
				1929-30	4.80	1948-49	7.00
				1930-31	6.91	1949-50	9.89
				1931-32	9.78	1950-51	9.85
				1932-33	8.39	1951-52	8.11
				1933-34	9.79	1952-53	7.71
				1934-35	7.48	1953-54	7.98
						1954-55	7.40
						1955-56	11.50
Average	11.87		10.01				9.29

Average for 55 years: 9.79

Rainfall September 1, 1956 to June 1, 1957 6.04

Table 2. Yield, Test Weight and Plant Height of Winter Wheat Varieties Grown at the Dryland Experiment Station.

Variety	No. yrs. grown	Yield 1955	Av. bu./a/	Test wt. av.	Plant ht. av.	Rank
Burt	3	31.2	32.4	61.9	26	1
Elmar	5	24.7	28.3	59.0	23	2
Elgin	5	26.0	27.6	59.4	23	3
Itana	3	27.3	27.4	61.5	27	4
Brevor	4	24.2	24.8	60.4	24	5
Kharkof	5	25.9	23.4	61.1	28	6
Columbia	3	23.2	23.2	61.4	25	7
Rio	5	26.5	22.5	61.3	28	8

Table 3 compares the yield of three new bread type winter wheat selections with standard white and red winter wheat varieties. The variety Columbia was released to growers in 1955. Columbia was developed by the Sherman Branch Experiment Station, Moro, Oregon. Columbia is selection from the cross Rio-Rex x Nebred.

Columbia is about five days earlier than Rio, smut resistant, stiff strawed and shatter resistant. Columbia is equal to Rio in winter hardiness, milling and baking quality. The variety is bearded, red chaffed and easily distinguished from other hard red varieties. In tests all over the Big Bend Area during the past four years, Columbia has been equal in yield and generally superior to Rio. In all tests Columbia has exceeded Rio yield by 5 per cent. Columbia is recommended for rainfall areas of 10 inches or less.

Table 3. Yield of Winter Varieties Grown at Lind, Harrington, Waterville and Horse Heavens During Years Indicated, Dry Land Experiment Station, Lind, Washington.

Variety	Harrington 1952-56 Inc.	Horse Haven 1952-54-55-56	Waterville 1952-54-55	Lind 1952-53-55	% Rio-all locations
Burt	48.8	21.6[b]	35.6	32.3	122
Elmar	43.4	21.8[b]	34.9	29.8	114
Itana	41.2	20.9[a]	40.0[a]	27.5	111
Brevor	41.2	22.2[b]	32.9	28.1	110
Columbia	40.2	19.2	33.2	23.2	103
Rio	38.5	19.9	30.4	22.4	100

[a]Not grown at this location--1955

[b]Not grown at this location--1952

The variety Burt was released to growers in 1956. Burt was formerly identified as 27 - 15 x Rio-Rex Selection 41. Burt is superior in yield to all varieties tested, averaging 22 per cent more than Rio in the Big Bend area during the past five years.

Selection 41 is smut resistant, stiff strawed, bearded, white chaffed, and two to three days earlier than Rio. It is somewhat susceptible to shattering, only slightly superior to Elmar in winter-hardiness, and less winter hardy than Columbia. Selection 41 is a hard white wheat with bread quality. Burt is recommended for the 9 to 14 inch rainfall area.

Itana is a selection developed with Columbia. It is a cross of Blackhull - Rex x Cheyenne. It is a superior yielding, hard red winter, with good winter hardiness, stiff straw and excellent quality. However, Itana is resistant to only some of the smut races. This variety was released jointly by Idaho and Montana in 1956. Seed of this variety is being increased for possible release in 1958 in Washington.

The winter-wheat breeding program at the Station is pointed toward increasing the yield, maintaining and improving smut resistance, and improving the winter hardiness and quality of hard red winter-wheat varieties. Smut testing is in cooperation with USDA at Pullman under the direction of Dr. C. S. Holton. Quality testing is conducted at the USDA Western Wheat Quality

Laboratory under the direction of Dr. M. A. Barmore at Pullman. These cooperating agencies made better and faster evaluation of the selections in a breeding program possible.

Variety recommendations for eastern Washington wheat, oats, and barley are given in Extension Miscellaneous Publication 14, available from your County Agent.

SPRING WHEAT

The spring wheat program at the Dry Land Experiment Station has four main objectives:

(1) Testing and introduction of available spring wheat varieties and breeding material from other areas,

(2) Improvement of superior spring wheat varieties by various breeding methods,

(3) Incorporation of resistance to leaf and stem rust, including 15 B stem rust, in varieties adapted to the Big Bend area, and

(4) Improving the quality and protein content of spring wheat adapted for this area.

Awned Onas had been crossed with good milling types of spring wheat. Selections from this cross have been milled and are now in yield trials. Thousands of additional selections with Awned Onas, Baart, and other good yielding varieties in their pedigree are being tested for quality and will be included in future yield trials. Milling quality is tested on a 5-gram milling--about 150 kernels. Quality tests can be made with grain from an individual plant. Selection for quality can be started about four to five years sooner in the breeding program. By this early selection for quality, new high quality varieties may be developed in a much shorter time.

Considerable emphasis is being placed on breeding for protein and yield. Recent research has shown that both high protein and high yield can be attained in the same variety. Many of the recent crosses have included parents which can produce high protein with good yield. The goal of our breeding program is to have high yield, high protein, good milling quality, and good agronomic characteristics in the same variety.

Table 4 shows the yields, test weights, and heights of eight spring wheat varieties grown at the Dry Land Experiment Station. Of those varieties, tested for 6 years, Marfed, Awned Onas and Lemhi have been the highest yielding. These varieties have not been recommended for this area because of poor quality when grown under low rainfall.

Baart is the recommended variety. Baart produces more straw and is more drought resistant. Baart yield has been satisfactory over a long time. For spring-wheat recommendations for your area, contact your County Agent.

In Table 5 are the yields of nine spring wheat varieties grown at Waterville, Harrington, Horse Heaven, and Lind for three or more years. The average yield figures at all locations show Marfed, Lemhi, Onas 52, and Awned Onas are the highest-yielding varieties for these years. These four varieties have poor milling quality and have not been recommended for the Big Bend Area.

Table 4. Yield, Test Weight, and Height of Spring Wheat Varieties Grown at the Dryland Experiment Station.

Variety	No. yrs. grown	Yield 1956	Av. bu/a	Test wt. av.	Plant ht. av.	Rank
Marfed	6	21.6	23.4	59.3	23	1
Lemhi	6	20.9	23.4	58.2	25	1
Awned Onas	6	20.7	22.8	59.6	23	2
Federation	6	22.7	22.3	59.2	23	3
Baart	6	19.1	20.9	60.7	25	4
Idaed	6	19.3	20.7	59.6	23	5
Henry	5	17.1	18.4	59.5	24	6
Thatcher	6	16.2	17.9	59.1	24	7

The Dry Land Experiment Station, in cooperation with the Agronomy Department at Pullman, is testing and breeding for resistance to 15 B stem rust in spring wheat. To date, this disease is not a problem in the Big Bend. This resistance is being incorporated in new hybrids as protection in case 15 B rust becomes serious. The first of these resistant selections were in the yield-testing stage in 1955. The hybrids are tested for 15 B rust in a cooperative program with the University of Manitoba, Winnepeg, Canada, and in rust nurseries in Mexico.

Table 5. Yield of Spring-Wheat Varieties Grown at Harrington, Horse Heavens, Waterville, and Lind during Years Indicated, Dry Land Experiment Station, Lind, Washington.

Variety	Harrington 1951-56 Inc.	Horse Heaven 1951-53-56	Waterville 1951, 53, 54, 56	Lind 1951-52, 54-56	% Baart-all locations
Marfed	34.2	23.4	32.0	23.1	111
Onas 52[a]	35.9	22.2	32.5	21.1	109[b]
Awned Onas	34.1	21.4	32.7	21.8	108
Lemhi	33.3	22.2	33.3	21.9	108
Federation	32.4	21.0	31.1	20.8	103
Idaed	33.7	20.9	28.4	19.2	191
Baart	31.2	20.9	29.7	20.1	100
Henry	32.3	20.7	26.8	18.4	97
Thatcher	29.9	18.6	22.7	17.4	88

[a] Onas 52 not grown in 1951.

[b] Percentage of Baart for years grown.

FERTILIZER TRIALS

In cooperation with the Agronomy Department, Pullman, the Dry Land Experiment Station has conducted experiments with nitrogen fertilizer for six years. Previously reported work (see Stations Circular 179) has shown that

the type of nitrogen fertilizer was less important than the method of application. The data showed that placing the fertilizer was more effective than broadcasting. The wheat uses the added nitrogen more efficiently when it is placed below the straw layer. For recommendations on nitrogen fertilizer, farmers are referred to their County Agents, who are kept up to date on recommendations for particular rainfall area.

Table 6, gives seven-year-average data on different rates of anhydrous ammonia fertilizer applications on land in summer fallow and seeded to Rio winter wheat. Fertilizer was applied in the fall preceding seeding. Cost and net profit figures are approximations on average for seven years. In two of the seven years, fertilizer response was not significant. Protein content of the wheat was increased at 40- and 80-pound treatments. This result would increase the net return slightly above figures given. The most return was from 40-pound application; there was a net loss at the 80-pound application, although yield was increased over check.

Recommendations for 9- to 11- inch rainfall areas, based on these 7 years' data and other trials are 25 to 40 pounds of nitrogen per acre on summer fallow. All types of nitrogen fertilizer have been equal in yield response when placed at a depth of 6 inches. Broadcast application is not recommended in the 9- to 10- inch rainfall area.

Farmers are urged to check the response to fertilizer applications. A soil test to determine available nitrogen in the soil is advisable. However, a test is not complete without a yield check on the response to the recommended rate of nitrogen application. Reliable field checks on response to fertilizer can be made by leaving a check strip unfertilized over a representative portion of the field. By a double application along the side of this unfertilized strip, the farmer can check if his fertilizer rate was high enough.

Harvesting these strips and weighing separately will require more time in harvest, but will return many times over the cost and time involved if the farmer finds his rate of application was too high or too low. Each 3 or 4 pounds of nitrogen should increase the yield by 1 bushel per acre. This ratio can be used as a guide to determine if the correct rate of nitrogen has been applied.

To date, experiments with sulfur and phosphate have not given any significant yield increase. The Station will continue testing with these elements to determine when they might be used profitably in wheat production.

Table 6. Summary of 7 years' Data of Different Rates of NH_3 Fertilizer on Winter Wheat, Variety Rio, Dry Land Experiment Station-Lind, Washington

Treatment lbs N/A	1950-56 7-yr. Av. Yield	Lbs. N per bu. inc.	Av. bu. per acre inc.	Net per acre profit[b] cost-ret. from Fertilizer
0	19.2	0.0	0.0	0.00
20	23.4	4.8	4.2	5.40
40	25.3	6.6	6.1	6.20
80	24.3[a]	15.7	5.1	-1.80

[a] Five year average.

[b] Cost of N at 15¢ a pound applied. Wheat value at $2.00 per bushel.

ANNUAL CROPPING

Research on annual cropping was revised in 1952. The Dry Land Experiment Station and Agronomy Department, Pullman, set up four locations for annual cropping experiments. These are on farms scattered throughout eastern Washington at locations with a rainfall from 9.5 to 15 inches annually. Cooperating farms are: C. W. Eckhart, Packard; Leonard Schultz, Harrington; and Ed Steckle, LaCrosse. The fourth location is on the Dry Land Station.

The research at LaCrosse is conducted in cooperation with the Soil Erosion Farm at Pullman and includes the study of crop rotation, green manure crops, and nitrogen fertilizers in annual cropping. The dry Land Experiment Station does not obtain the data at the LaCrosse location.

At all locations conventional equipment is used for tillage and harvesting. Three rates of fertilizer are used on both summer fallow and annual cropping plots. The soil is sampled in the fall to determine the amount of available nitrates and again in the spring for available mositure.

In 1955, annual cropping at Lind and Packard was a failure. Yields at Harrington were from 6 to 8 bushels per acre. The four-year average indicates that approximately as much wheat can be grown under annual cropping as with summer fallow at all three locations. However, additional costs of cropping annually would make annual cropping less profitable.

In two of the four years, annual cropping at Harrington was more profitable than summer fallow. From the results to date, only Harrington appears to have possibilities for annual cropping. To be profitable at Harrington, annual cropping could be used only in years of good spring soil moisture reserve.

There has been an increase in weed infestation at all locations. Cheatgrass has heavily infested annual cropped plots at Lind and Packard in one or more years of the experiment.

Table 7. Yield of Winter and Spring Wheat on Summer Fallow and Annual Cropping at Three Locations, Dry Land Experiment Station, Lind, Washington

Location	Av. annual precipitation crop year	N. applied lbs./A.	Yield Bu./A. Winter wheat 4 yr. av. summer fallow	yearly av. s. fallow	Spring wheat yearly av. annual cropping
Lind	8.65	0	15.7[a]	7.9	
		20	16.5[a]	8.3	7.7
		40	15.9[a]	8.0	8.4
C. W. Eckhardt Packard	11.4	0	19.2	9.6	
		20	21.5	10.8	11.0
		40	20.5	10.3	11.5
L. Schultz Harrington	11.3	0	40.3	20.2	
		30	43.4	21.7	21.0
		60	43.3	21.7	23.7

[a] Average on 3 year basis.

FORAGE INVESTIGATIONS

Forage Adaptation Tests

Grasses and legumes for soil and moisture conservation are being tested at the Dry Land Experiment Station in cooperation with the Soil Conservation Service, Nursery Division. The initial testing is done at Pullman. Lind is one of a system of outlying nurseries under different soil and climatic conditions to carry on secondary testing.

The following data supplement material presented at previous field days.

Fall 1943, Dry-Land Grass Plots

Eighteen grasses were selected on the basis of past performance at Lind and seeded in fall of 1943. The purpose of this planting was to compare conservation uses and hay yields for the 10- to 14- inch rainfall area. In dryland rotations, grass roots add organic matter to the soil. This organic matter helps maintain fertility and improves the physical condition. The soil is more resistant to wind and water erosion when it is well supplied with fibrous grass roots and active organic matter. Hay yields, along with root production, longevity, drought resistance, ground cover, and availability of seed, should be considered in selecting grasses for conservation seeding. The following grasses have been outstanding under dry-land conditions at Lind:

Dry-land bunch grasses:	Crested wheatgrass Whitmar beardless wheatgrass
Sod-forming grasses:	Pubescent wheatgrass
Dry-land blue grasses:	Sherman big bluegrass
Fine-leaved fescues:	Sheep fescue P-274

From results obtained at this Station and in other dry-land areas, the following grasses can be recommended in the wheat-fallow area of from 8 to 14 inches annual rainfall:

Range and pasture

1. Crested wheatgrass, 6 pounds; and Bulbous bluegrass,* 2 pounds.
2. Whitmar beardless wheatgrass, 8 pounds; and Bulbous bluegrass,* 2 pounds.

Hay

1. Sherman big bluegrass, 4 pounds; and Ladak alfalfa, 2 pounds, seeded in alternate rows.
2. Sherman big bluegrass, 4 pounds.

*Bulbous bluegrass is not recommended where rainfall is less than 11 inches.

METHODS OF PLANTING GRASSES

Among the several methods of planting grasses, the most satisfactory stands have been obtained by using a drill in a clean summer fallow. The drill can be adjusted to seed any desired rate and depth. If the stubble land is clean, grass can be established successfully by seeding the stubble in early fall. Since the grass grows very slowly during the seeding stage, the seed bed should be free of weeds.

The rate of seeding grass most suitable for pasture is 5 to 8 pounds per acre. This will establish a stand uniform enough to prevent invasion of weeds. The depth of planting should be 1/2 to 1 inch. Proper depth can be secured by using depth regulators on the furrow openers or having the hose fastened outside of the furrow openers. A drag chain or press wheel can be used with the latter to cover the seed with about 1/2 inch of soil.

The best time to seed grass in the 10 to 12 inch rainfall area is in the fall. If moisture conditions are suitable, grass can be sown from September 1 to January 1, but the ideal time is in October. Spring seeding is not recommended, except in years of high spring moisture.

Depending on the use to which the grass is to be put, row spacing may vary from 7 inches to 3 feet. The wider the row spacing, the more care required to control the weeds that may invade the stand between the rows. The 14-inch row spacing seems to be the most satisfactory for forage. Wider spacing than this make the grass coarse and less desirable for pasture. Seed production is more successful in rows 28 to 36 inches apart. Seed production fields must be cultivated for good yields and weed control.

Uniform stands of grass can be established by seeding a cereal nurse crop in alternate rows with grass. The grain yield of the nurse crops is approximately 70 per cent of normal, while at the same time satisfactory grass stands are established. The nurse crop can be cut for hay or left to mature for grain. The nurse crop uses the soil moisture that would otherwise be used up by the weeds. Thus the nurse crop provides a satisfactory weed-control measure.

The ordinary double-run grain drill can be adjusted to seed the two crops in alternate rows by having removable partitions placed in the grain box. The proper rate of seeding for both the crops can be made at the same setting. Reducers made of heavy wire can be used very effectively to change seeding rate of either grass or wheat. The recommended rates of grass and nurse crop seeding are 8 pounds and 30 pounds, respectively. If rye is used as a nurse crop, cut the rate to 20 pounds per acre. Lessen spring tensions on the furrow openers of the drill sowing grass so that the seed will not be buried too deeply in the soil.

TREES AND SHRUBS FOR DRY-LAND PLANTING

Several species of trees and shrubs are included in the Station forestry project for farm-home landscaping and windbreaks. The first plantings are now over 30 years old. Plantings have been made at intervals since the original planting. The Station planting is now considered to be one of the best in the West for studying trees and shrubs adapted to dry-land conditions.

Initial observation tests of wood species are carried on at the Soil Conservation Nursery at Pullman. Secondary tests are carried on cooperatively at experiment stations at Prosser and Lind, Washington, and Moro, Oregon. The present testing program at Lind was started in 1928 by the Dry Land Experiment Station and the Department of Forestry and Range Management, State College of Washington.

A standard dry-land windbreak planting consists of a minimum of five rows which, when properly established, give excellent protection from the winds. Results to date indicate that Caragana is still the best erect shrub. Blue leaf honeysuckle and Nanking cherry are showing considerable promise. Russian olive is the recommended species of intermediate shrubs. Hawthorn and a strain of wild crab apple are showing promise. Black locust is still the most promising deciduous tree. Green ash and Chinese elm are good but they do not show the promise of black locust. Austrian pine is the outstanding evergreen tree, being superior to both Scotch and Ponderosa pine. Norway spruce, Douglas fir and Blue spruce can be grown but require more care and have a much slower growth. Rocky Mountain juniper is showing the most promise in this group.

Farmers contemplating a shelterbelt planting should realize that considerable work is involved. To survive under dry-land conditions, trees require continuous clean cultivation. Space rows between trees so available machinery can be used. Transplant trees and shrubs as soon as you get them. Pine and juniper require special care when transplanting. Transplanted evergreen stock has given better survival than seeding stock. Although transplanted stock is more expensive, the superior survival will compensate for the extra cost.

Table 8. Standard Species, Arrangement, and Spacing of Trees and Shrubs for Windbreak Plantings in the 8-10 Inch Rainfall Area.

Row No.	Species	Growth habit	Spacing in row	Minimum distance from next row[a]
1	Caragana	Erect shrub	3 ft.	18 ft.
2	Russian Olive	Intermediate shrub	6 ft.	18 ft.
3 & 4	Black Locust	Deciduous tree	12 ft.	18 ft.
5	Austrian pine Scotch pine Ponderosa pine Norway spruce	Evergreen	12 ft.	27 ft.

[a]Rows may be spaced wider apart if cultivation equipment requires it.