Grass Seed Production Under Irrigation In Oklahoma

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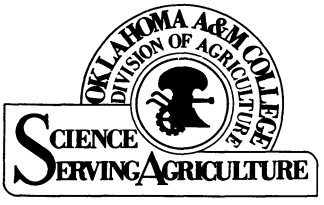

EXPERIMENT STATION

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CONTENTS

Row Irrigation For Grass Seed Production, El Reno

Even bunch grasses like the Coronado side-oats grama shown here tend to fill in the rows and make solid stands. To keep the grasses in rows an occasional severe pruning with a cultivator may be necessary. Borders here have a 0.1% slope, are 33 feet wide, and a low temporary dyke is thrown up in the place of each 12th row by the disks of a cultivator. These may be leveled out at any time. Smooth, evenly planned land is very important. Water should not be applied faster than the soil can take it in. Provision must be made for disposal of tail water and surplus water following heavy rains. Even, uniform stands are essential to keeping the field free of weeds and preventing trouble at harvest time.

Grass Seed ProductionUnder Irrigation in Oklahoma

Jack R. Harlan, Robert M. Ahring and William R. Kneebone*[1]

It is estimated that over twelve million acres in the Southern Great Plains need to be seeded to permanent grass cover because they are not suited to cultivation. There are additional millions of acres which should be established to perennial grasses for an indefinite period of time in order to adjust crop acreages in line with production needs and to help preserve or improve the soil. Under present conditions such a grassland program cannot be carried out because of the chronic shortage of adapted grass seeds.

With the rapid development of irrigation in the state, with the present need for developing new cash crops, and with a long history of chronic seed shortage, many people are becoming interested in the possibilities of producing grass seed under irrigation in Oklahoma.

This publication provides some practical guides to seed production at locations where irrigation water is available. The recommendations are based on three years of intensive study at the Ft. Reno Livestock Research Station at El Reno, and a number of years of experience at the U. S. Southern Great Plains Station at Woodward.

The Soil and the Irrigation System

Any irrigation installation should be carefully designed for the soil, the terrain, the crops, and the water supply. It is beyond the scope of this publication to consider these factors in detail.**

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**For information on irrigation installations, see your County Agent. He can give you information on local conditions affecting water supplies and methods of applying water. Also see Oklahoma Extension Circulars 632, "Sprinkler Irrigation in Oklahoma"; 641, "Irrigation; Steps to Consider"; and 645, "Irrigation Water from Wells."

As a general rule, if the land is even and level or nearly so, and especially if the soil is slowly permeable, the grasses should be established in rows and row-irrigated. Exceptions to this are buffalo grass which can be established in a solid turf, and possibly blue grama which can be seeded in close drills to establish a solid stand.

If the land is rolling and/or sandy, a sprinkler system must be used. Row cultivation of most of the grasses is desirable unless erosion is likely to result. Tall grasses such as blue panic, switchgrass and sand bluestem are difficult to water well with most sprinkler systems.

In the case of furrow irrigation of grasses, it is especially important to have the land well planed and even before seeding. After a perennial crop is planted, it is difficult to correct for low spots and high spots. The land cannot be planed once a year and the unevenness gradually corrected, as is done with annual crops. Some grasses spread rather vigorously, and even bunch grasses develop very large crowns over a period of years. In most cases it will be necessary to trim these crowns severely in order to keep the grasses in rows and maintain open furrows for irrigation.

Unless the borders are quite short, a slight slope, (about 0.1%) is desirable and provision must, of course, be made to dispose of both waste tail water and surplus water falling as rain.

Water should not be delivered too fast for the soil to take it in. Suitable siphons at the head ditch, careful adjustment of gated pipe, and proper selection of orifice size for the sprinkler heads will adjust water delivery to the proper rate.

Establishing Stands

One of the most important and probably the most difficult step in producing grass seed is in obtaining uniform, clean stands of the grass. Skips and thin spots in the row invite weeds and contaminating grasses which cause much trouble later on. In most cases a poor stand is not worth keeping and should be plowed out and replanted. Irrigated land is too valuable to remain vacant or unproductive very long.

If the land is rolling and irrigated with a sprinkler system, the best procedure will probably be to establish a crop of close-drilled sorghum the year before, mow it or graze it in such a way as to leave an even plant residue over the surface of the soil, and then drill the seed directly into the mulch. This is the same method recommended for dryland seeding. It is the one most likely to control erosion, to prevent baking and crusting of the soil, and to obtain a uniform stand of grass. Seeding should be made in late winter on this type of seedbed, in order to minimize weed competition.

If the land is level, clean seedbeds can be used without much danger of erosion. May is usually the best date of planting for warm-season

grasses on clean seedbeds. September is the best for cool-season grasses. All seedbeds should be firm and as free of weeds as possible. A thin mulch of small clods on the surface of a clean seedbed often prevents too rapid drying out or crusting of a fine-textured soil. Generally speaking, the soil should be pre-irrigated, and the seed sown into moist soil as soon as it is possible to get on the land. Seed should not be planted over ½ to ¾ inches deep, and very shallow seedings are often desirable.

A heavy rain immediately after seeding is the most common cause of stand failures. Once the soil surface is packed and sealed by a hard rain very poor emergence can be expected, and rotary hoes and similar devices for breaking the crust are seldom successful in bringing up a stand. Hot, dry and windy weather immediately after seeding is also a hazard. It is possible with row-irrigation to water up a stand that is in danger of being lost by drying. A very small trickle of water should be allowed to flow down the furrow until the moisture spreads laterally to the row of seedlings. Flooding or sprinkling usually results in sealing up the soil and destroying the stand.

If good seed is used and they are placed at a shallow depth into warm, moist soil, emergence is usually very rapid. A stand of seedlings may be obtained in a matter of days. Once the stand is up, so that crusting of the soil is no longer a problem, moisture can be supplied as needed. Then weed competition becomes the chief hazard.

Weeds must be carefully controlled the year of seeding if a seed crop is to be obtained that year. Careful weed control the first year also helps get a uniform stand which will help control weeds in future years. Cultivation can be made very close to the seedlings by mounting disks at the front of the cultivator. These should be turned to pull the soil away from the seedlings, and the sweeps that follow should be set flat and adjusted so as to just bring the soil back where it was and not cover the plants. Shields can be used, but the disk does a better job close to the plants than does a diamond point or shovel. A sugar beet cultivator with adjustable knives is also a very desirable tool at this stage.

Cultivation alone will not keep the young stand completely free of weeds. Spraying with 2,4-D will help control such common weeds as puncture vine and pigweed, or even bindweed; but seedling stands should not be sprayed until most of the grass plants have about five leaves. Very young grass seedlings are quite sensitive to 2,4-D. Furthermore, too much dependence should not be placed on this herbicide since many of the most serious weeds are likely to be annual grasses which are not controlled by 2,4-D. By and large, there is no substitute for hand hoeing and weeding down the row, and this should be done early before the weeds begin to compete seriously with the stand of grass. This is admittedly an expensive practice, but usually pays off in clean, even stands that give little trouble after the first year and greatly reduce the difficulties in harvesting, cleaning and

processing the seed.

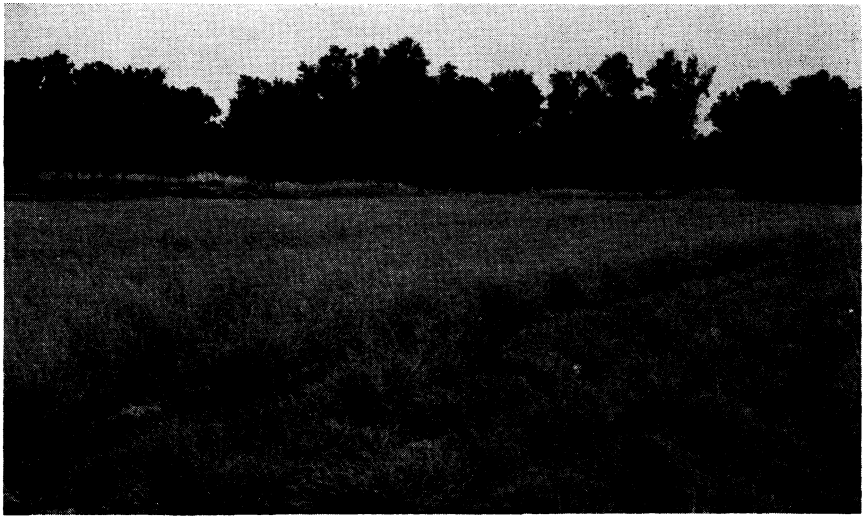
If a full stand is obtained promptly after seeding in May, and the seedlings are kept free of weed competition until midsummer, little trouble from weeds is expected thereafter, as long as a good stand is maintained. Furthermore, grasses such as side-oats grama should produce a good crop of seed in the fall of the year of seeding under these conditions. If, however, weeds are allowed to compete with the grass, little can be expected the first year; and if thin spots or skips in the stand occur due to early weed competition, trouble may be expected for years to come.

Seeding rates vary greatly with seed quality; but, as a general rule 25 viable seeds per foot of row is a very adequate seeding rate, and one established plant per foot is an adequate stand. If weeds can be controlled in the early stage of establishment, thinner stands and lower seeding rates are also satisfactory.

Recommendations for Specific Grasses

SIDE-OATS GRAMA.

Recommended varieties for seed production are Coronado and Tucson. The Coronado produces the most, the largest, and the highest quality seed. Both will give a seed crop the year of seeding and two crops per year thereafter.



Coronado side-oats grama, El Reno. Aftermath growth following the first seed crop. This variety has exceptionally good seeding habits and is one of the easiest of the native grasses to grow for seed production. Two crops a year are expected after the year of seeding. About 50 pounds actual nitrogen per acre is recommended per seed crop, or if the soil is fertile, the second crop only need be fertilized.

Well established stands respond to nitrogen applications, but this grass should not be over-fertilized. Apparently, about 50 pounds of actual nitrogen per acre per seed crop is about right on most soils. If the soil is quite fertile, an application of 50 pounds of actual nitrogen after the first crop is harvested may be adequate.

Heavy infestations of thrips or gall midges should be controlled during bloom. One half pound actual Dieldrin per acre usually gives good control.

Harvesting at the right time is extremely important. Harvest with a combine or a header, or bind and thresh from the shock. A light milling and a run over a fanning mill is desirable.

The seed is best marketed in the spike; additional refining may impair field performance.

Expected yields: 500 to 600 pounds of high quality seed per acre.

BLUE GRAMA.

The most important factor in producing blue grama seed is time of blooming. In Oklahoma, blue grama should bloom in September in order to fill properly. Do **not** water until about August 15th. If growth is induced by rain, the stand can be grazed heavily or mowed several times. In mid-August livestock should be removed, about 50 pounds of actual nitrogen applied, and the first irrigation made. Keep the soil moist for the following six weeks and check thrips and gall midge infestation very closely. If insects appear in dangerous amounts, spray once or twice with Dieldrin as for side-oats grama.

Use a good strain of southern origin. Harvest with a combine. The aftermath makes excellent hay.

Expected yields: 300 to 400 pounds of high quality seed per acre.

SWITCHGRASS.

The recommended variety for seed production is Caddo.

This variety has very strong aftermath growth, but will not produce two seed crops a year. A seed crop can be produced either in mid-summer or in the fall, depending on weather conditions. In very hot, dry years, many of the spikelets blast and fail to set seed even when the soil is kept moist. In such years it pays to take a hay crop about July 1 and try for an October seed crop. If the summers are moderate, the first seed crop is definitely the best.

Good responses to nitrogen fertilization may be expected in older stands, but detailed recommendations cannot be made at the present time. A study conducted at the Woodward station indicated a split application—one when the grass greened up in the spring and one

Caddo switch grass in rows for seed production, irrigated, El Reno. This variety is the most uniform, the best adapted and produces the most aftermath of any variety of switchgrass tested in Oklahoma. Yields under irrigation should be in the neighborhood of 500 to 600 pounds of high quality seed per acre. The ease of harvesting, threshing and cleaning help make it one of the most profitable native grass seed crops.

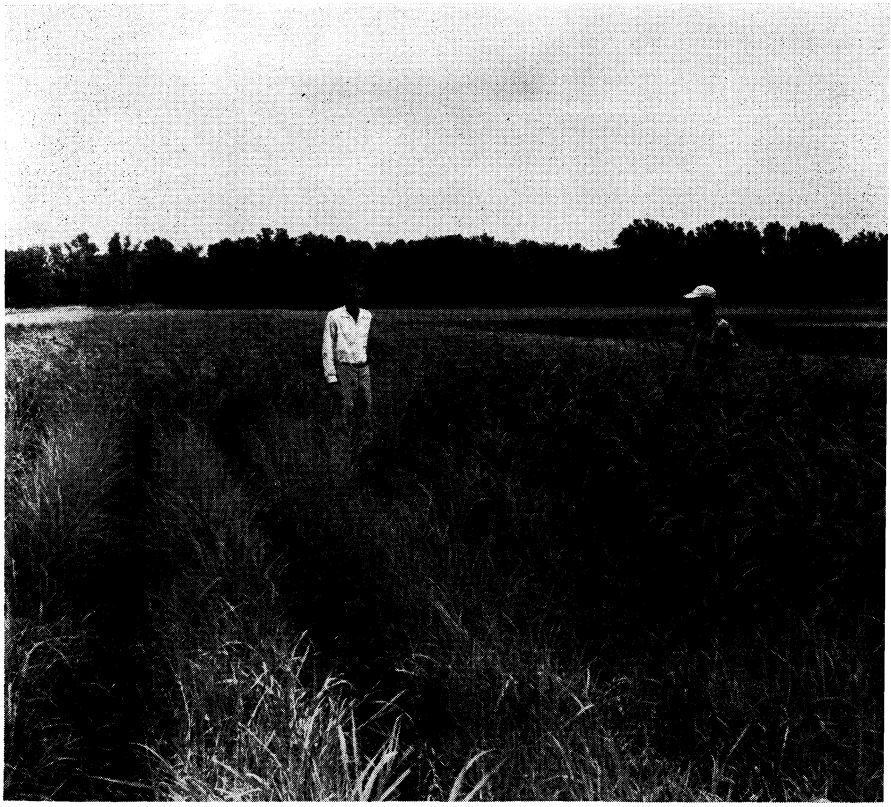
in the boot stage—was more efficient than a single application. Seventy-five to 100 pounds of actual nitrogen could probably be used. Harvest with a combine or a header, or bind and thresh from the shock. Expected yields: 500 to 600 pounds of high quality seed per acre.

BLUE PANIC.

Commercial material is recommended at the present time since no improved varieties are presently available.

Blue panic has a tremendous appetite for nitrogen, but also a remarkable capacity to produce. Even on very fertile soils, older stands become yellow and low in production unless liberally supplied with nitrogen. Table I shows two years results at El Reno.

Evidently as much as 800 pounds of seed may be obtained per acre in two crops; but, at the higher rates of fertilization, it requires about 1 pound of actual nitrogen to get an additional pound of seed. This, of course, is profitable at the present price of seed and fertilizer.



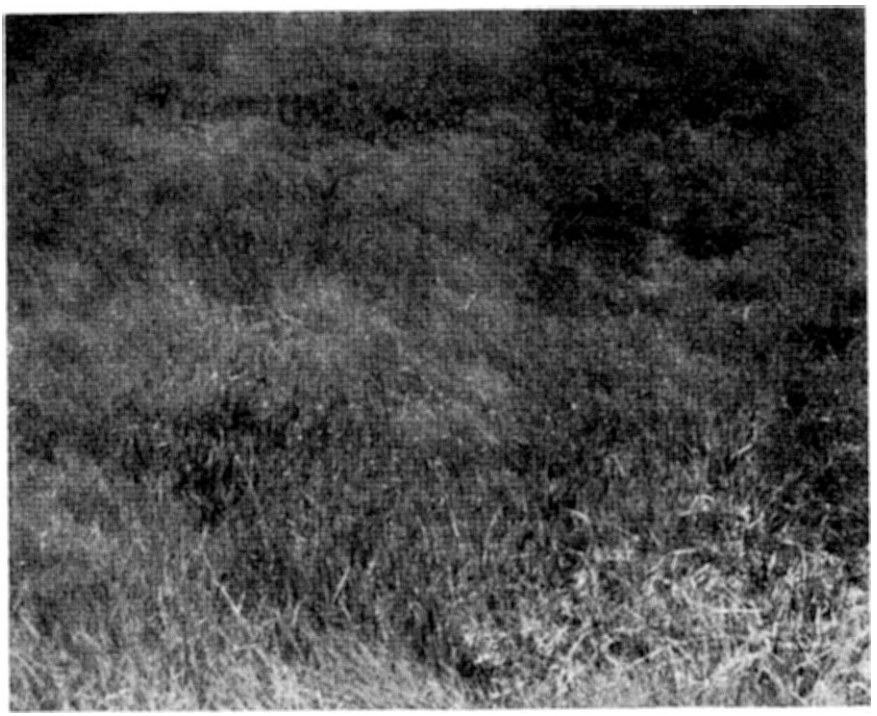
Blue Panic seed block, El Reno. The great responses obtained from nitrogen applications are shown. On the left a check plot with expected seed yield in the second crop of zero. On the right, high nitrogen with the second seed crop coming into head. To the left rear, high nitrogen plus phosphate. Additional phosphorus has not increased seed yields on this soil type.

The best harvesting procedure, when high yields are expected, is to bind and thresh from the shock.

BUFFALOGRASS.

Studies with a selected single-cross variety of buffalograss indicate that high yields of burs are possible under certain conditions. The material consisted of one female plant and one male plant, established by plugs so that about 80% of the area was occupied by the female plant and about 20% by the male plant. The female selection has unusually long stalks, bearing the burs 5 to 6 inches off the ground, and is also rather shatter resistant. False smut was not a factor in 1955, accounting in part for the high yields indicated here:

Pounds of actual nitrogen	0	60	180	60 plus 180 lb. P_2O_5
Pounds of Clean Burs				
First crop	1,118	1,045	937	1,053
Second crop	290	363	290	305
Total	1,408	1,408	1,127	1,358



Buffalograss block for seed production at El Reno. Selected varieties produce up to 1000 pounds of well-filled high quality burs per acre, making this grass one of the most profitable of the native grasses from the seed production point of view. In some years false smut may greatly reduce these yields. Like other native grasses buffalograss can be easily over-fertilized. About 50 pounds actual nitrogen per seed crop is recommended.

Note that overfertilization sharply reduced the yield by stimulating weeds.

Combines can be especially modified to harvest buffalograss, but when the burs are borne as high off the ground as in this selection it is simpler to mow, windrow, and pick up the hay out of the windrow. If wind is likely to roll over the windrow, the hay can be raked and threshed from the stack. A rather high recovery is obtained from this selection because of its shatter resistance.

In years when false smut is a problem, much lower yields can be expected.

SAND BLUESTEM.

Detailed studies have not yet been made. In the Woodward variety, delayed blooming by mowing in June reduced seed set and it is expected that the normal blooming time will produce the most seed in this variety. Harvest with a combine, or bind and thresh from the shock. Expected yields: 200 to 300 lbs. of seed per acre.

Woodward sand bluestem under irrigation at the El Reno station. This selected variety has a consistently higher seed set than any other known source, is fairly uniform in height, can be harvested with a combine, and produces very leafy forage. Seed yields are not very high, but this variety presents the best hope at present of developing a seed supply of this very valuable grass.

Sand lovegrass under irrigation, El Reno. One of the easiest native grasses to handle from the cleaning and processing point of view, sand lovegrass has long been a profitable seed crop on dry land. Experiments at El Reno indicate that high yields under irrigation will make it an excellent cash crop for irrigated land in western Oklahoma. Aftermath grazing is excellent.

SAND LOVEGRASS.

This grass has the same problem as switchgrass with respect to time of bloom. In some years it may be desirable to mow about July 1 and harvest a late seed crop. In other years the early seed crop is by far the best. In 1955, thirty times as much seed was obtained when the grass was not mowed; but in 1954 many of the heads blasted when blooming at the normal time. In most years mowing is not recommended for maximum seed yields.

Harvest with a combine, or header, or bind and thresh from the shock. Expected yields: 400 to 600 lbs. of seed per acre.

BROMEGRASS.

Studies were conducted on an old field selection from the Woodward station which is believed to be fairly representative of southern bromegrass in general. The variety recommended for Oklahoma is Southland. Yields for two years were:

Pounds of actual nitrogen	0	60	180	60 plus 180 lbs. P_2O_5
Pounds of seed				
1954	238	131	115	218
1955	599	521	458	563

On this soil no advantage was obtained from spring fertilization. Studies on dryland indicate that fall applications, or split fall and spring applications, are preferable. Many of the seed heads were blasted in 1954, and the 1955 yields are more typical of what might be expected in most years.

TABLE I.—Yields of Blue Panic Seed With Various Nitrogen Treatment; Ft. Reno Livestock Research Station, El Reno; 1954 and 1955.

Nitrogen Application (pounds of actual nitrogen per acre)	YIELD (pounds of seed per acre) First Crop	Second Crop	Total
	1954		
0	79	---	79
60	118	---	118
180	182	---	182
	1955		
0	109	0	109
120 & 120*	399	86	485
180 & 180*	454	363	817

* Split applications; for example, 120 pounds on first crop and 120 on second crop.