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Grass Seed Production in South Dakota Guidelines

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Grass Seed Production:

Guidelines

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Contents

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INTRODUCTION

Finding ways to supplement a farm income can be difficult, yet many producers have found alternative enterprises for their farming operation.

One of which many South Dakota farmers are considering is growing grass seed. Because of the increased demand for grass seed it is fast becoming a profitable alternative to traditional or row-crop production.

The economic viability of producing grass seed can vary widely. However, with an understanding of the risks involved--production costs, the weather, government programs, and the presence of weeds and damaging insects--growing grass seed can be a worthwhile investment.

Producers need to be aware that decisions to produce grass seed should be based not only on the perceived profitability of such a crop but also their ability to handle risk.

Government programs which influence grass seed prices, such as the Conservation Reserve Program (CRP), are subject to budget cuts and provisions. It was the CRP itself that increased the demand for grass seed by developing provisions to reduce surplus grain stocks by decreasing crop acreages.

Also, given the apparent profitability of grass seed production, many producers will probably start up. This will increase grass seed supplies in the years ahead, resulting in downward pressure on prices.

This bulletin is intended to aid South Dakota producers in the establishment and management of grass seed production acreages. Economic and marketing concerns are also addressed.

PRODUCTION PRACTICES

Row Spacing

Grass stands seeded in rows provide the greatest seed yields and allow for easier cultivation and fertilizer placement. Grasses grown in rows endure less competition, having more access to soil nutrients, water, and sunlight (Fig. 1).

Optimum row spacing varies 4 ft in western South Dakota to 3 ft in the east. Annual precipitation is the major

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Fig 1. Grass that will be combined and marketed will give higher yields when planted in rows.

criterion in determining row spacing. Irrigation may allow 9- to 18-inch row spacing, depending upon the grass species.

Those who have cultivation equipment for row crops such as corn and soybeans will likely obtain good seed yields by utilizing their traditional row spacings.

Time of Planting

Time of planting depends upon species. Cool-season grasses may be seeded in early spring or late summer. Late summer plantings may alleviate weed control problems, and plantings can be drilled into small grain stubbles of the previous growing season.

However, moisture conditions are usually better for spring plantings, and first-harvest seed yields are often greater when compared to summer planted stands.

Warm-season grasses usually require mid to late-spring plantings.

Seedbed Preparation

Seedbed preparation should be as for typical forage species establishment. A firm seedbed is essential for adequate seedling establishment (Fig. 2). Since row-crop practices are employed, the area should be level and moderately well-drained so soil erosion is minimized. The land should be weed free. Weeds not only present the grass stand with unwanted competition, but also may contaminate the seed harvest and make the product unmarketable.

Plantings may be done on clean, well-packed soil or in undisturbed stubble of sorghum, sudan, or small grains.

Seeding Depth

Forage grass species are small-seeded and therefore sensitive to excessive planting depths. In general, do not exceed a planting depth of 1/2 inch; however, larger seeded species such as smooth bromegrass may be planted at a 3/4-inch depth.

Planting Equipment

Good seed-to-soil contact is a must for successful germination and establishment, so plant into a firm seedbed and pack the seeds after planting.

Seed-to-soil contact may be enhanced by cultipacking after the planting operation or by using a planter

Fig 2. Grass seed is small; a firm seedbed is essential for establishment. Match row spacing to your existing equipment.

equipped with packer wheels that follow the furrow openers. Shoe-type corn planters may be used if they are equipped with modified seed plates for small seeds, or use a grain drill with drill cups appropriately plugged for proper row spacing.

Be sure the planter has good planting depth control at 1/2 inch.

Companion Crop

A companion crop should be avoided; young grass seedlings are sensitive to competition.

If a companion crop is used, the seeding rate of the cover species should be reduced to 50% of the normal rate. Planting the cover crop and grass in alternate rows will minimize competitive effects on the grass seedlings.

Seeding Rate

Wide row spacings allow a reduction in seeding rate; however, do not use such a reduced rate that light and nutrient resources are not efficiently utilized. Try to plant at least 25 to 30 pure live seed (PLS) per linear foot of row. A higher seeding rate may be used for irrigated stands.

Do not reduce seeding rates in an effort to reduce seeding costs, because significant yield reductions can likely occur.

Fertilization

Fertilization at seeding time is often not recommended because it encourages weeds. A band of fertilizer placed below, but not in contact with the seed, may enhance seedling vigor.

Nitrogen is the most important soil nutrient in grass seed production. The amount of nitrogen fertilizer applied should be based on soil test recommendations. New seedlings may benefit from a nitrogen fertilizer application at the 2- to 3-leaf stage.

For established cool-season species, fall applications of nitrogen have produced consistent yield benefits. Late spring nitrogen fertilization tends to promote vegetative growth rather than seed yield.

For established warm-season species, however, nitrogen should be applied in early spring. Excessive nitrogen fertilization will promote lodging. Fertilization with P and K should also be based upon soil test results.

Irrigation

Irrigation benefits grass seed production. During establishment, moisture availability is very important for emergence, so keep the soil surface moist to prevent crusting.

For established stands, flood irrigation should be avoided; however, furrow and sprinkler irrigations work well. Irrigate often enough to maintain continuous plant growth. However, do not sprinkler irrigate once flowering begins because this may reduce pollination.

Weed Control

Weeds compete with desired grasses and may contaminate the harvested seed, making it unmarketable. Accepted forms of weed control include cultivation, herbicides, mowing, and hand roguing. Make sure to follow label directions when using herbicides. See SDSU Extension Fact Sheet 525P for a complete discussion of current weed control methods for forage grasses.

Seed Production from Established Stands

Because of the shortage of grass seed, caused partially by the Conservation Reserve Program, interest has grown in harvesting seed from established grass stands. Although this may seem attractive from an economic standpoint, very little research has evaluated the potential of this practice.

Results with sideoats grama (Smika and Newell, 1965) and western wheatgrass (Smika and Newell, 1966) indicate irrigating with sufficient water to fill the root zone in the fall and at heading produced the highest seed yields. Applying nitrogen at 40 lb/A of nitrogen in conjunction with these irrigations appeared to be an optimum rate of fertilization.

These results indicate that seed producers may want to investigate applying additional water to their established grass stands. Otherwise, they are totally dependent upon natural sources to supply this water, and under drought conditions seed yields may be reduced.

Avoid grazing during the previous fall so that carbohydrate reserves will accumulate.

The greatest problem with using pastures for seed production is weeds. The grass seed may not be marketable. Pastures should be thoroughly inspected for weeds before considering seed production.

Postharvest Stand Management

Grass crop residue is generally removed from the field after a seed harvest. This removal aids in reducing build-up of diseases or insects. Most grass residue is removed and used for feed or bedding (Moyer et al., 1977).

No general recommendations can be made on the effects of grazing either before or after a seed harvest (Wheeler and Hill, 1957). Grass species differ dramatically in response to stubble grazing (Fulkerson, 1980). Additional research is needed before recommendations can be made.

SPECIES CHARACTERISTICS

General principles of grass seed production (previous sections and Appendix 1) apply to all plantings. Several grass species require additional knowledge.

Warm-Season Native Grasses

Big bluestem, little bluestem, and Indiangrass produce hairy seed units that are difficult to plant with conventional equipment. A drill containing agitators in the seed boxes works best.

These species produce abundant forage on stems that may reach a height

of 8 ft in the case of big bluestem and Indiangrass. When direct-combining, cut as high as possible to prevent overloading with leaf and stem material that is hard to separate from the seed units.

Variety selection is important for all native warm-season grasses, including the above mentioned species, switchgrass, and the grama grasses. Southern varieties will not consistently produce mature seed when grown over 200 miles north of their area of origin.

These species do not establish as quickly as the cool-season introduced grasses (wheatgrasses), and a seed crop will not generally be produced the year of planting.

Severe Shattering Grasses

Creeping foxtail, reed canarygrass, and green needlegrass can shatter as the seed approaches maturity. Seeds ripen from the top of the panicle downward and shatter more easily when mature. These species should be monitored closely after flowering, so harvest is conducted at the optimum stage (Appendix 1).

HARVESTING

Time of Harvest

Timing of seed harvest is critical. Harvesting at the proper time is essential to avoid seed losses. Harvesting too early can reduce seed viability, while harvesting too late can cause seed loss by shattering.

Most grass species do not mature uniformly, therefore some judgement is involved in determining the proper time for harvest. The ripening process begins at the top of the seedhead and moves downward, leaving the top of the head prone to shattering, while the bottom may only be beginning to set seed. You must compromise between seed maturity and shattering. Research (Lawrence, 1960) and experience demonstrate that most grasses should be harvested when most of the seed has reached the hard-dough stage of maturity. Seed is in this stage when a high amount of thumbnail pressure is required to produce an imprint on the seed.

To make this determination, it is imperative to make daily inspections in the field during and after the flowering period (Fig. 3).

HARVEST METHOD

There are three harvest method options: 1) direct combining, 2) windrowing and combining, and 3) stripping.

Direct combining requires less time and labor; however, greater seed loss may occur. Direct combining begins when

Fig 3. Harvest when most of seed is in hard-dough stage; you will have to inspect the field daily to find best time.

approximately 5 to 15% of the seed is still immature and some of the mature seed is starting to shatter.

Since the seed may have a higher moisture content than if it is windrowed and cured in the field, some additional drying after the harvest may be necessary. You can spread out the seed in a thin layer on a building floor or on trays in the sun.

Artificial drying is another acceptable method, but it does require considerable investment. The drying air temperature should not exceed 90 to 110^{o} F to avoid seed viability losses.

Windrowing, curing, and pick-up combining is the second possibility. The main advantage is that since the seed is cured in the field, it will have a low enough moisture content so there is no need for additional drying (Fig. 4). There are two disadvantages: 1) the windrow may be scattered by a strong wind, causing the seed to shatter, and 2) rain can make the windrow too wet to thresh.

The windrowed material should have low enough moisture content for combining in two to five days, depending on initial moisture content when cut, and weather conditions.

Grain combines can be used for threshing grass seed with several modifications. Cylinder speed must be adjusted it can thresh the seed but slowly enough to avoid cracking and other seed damage. Cylinder speed is measured in feet per minute (rpm x cylinder diameter in feet. x 3.14). Approximately 5,000 ft per minute works well for most grass species (Holzworth and Wiesner, 1985).

Cylinder spacing should be adjusted depending upon seed size. A 1/4-inch concave clearance works well for most species. However, for small-seeded grasses such as switchgrass, a 1/8-inch clearance should be used. The material from the grain spout and tailings should be examined frequently for cleanliness and damage during combining. Adjustments may be needed, depending on the species being harvested.

Strippers are sometimes used to harvest native grass species. These machines are towed through the field, and seed material is removed by hand. Harvest losses can be high.

Storage

The storage life of seed varies among species and is influenced by initial seed quality, seed moisture, and

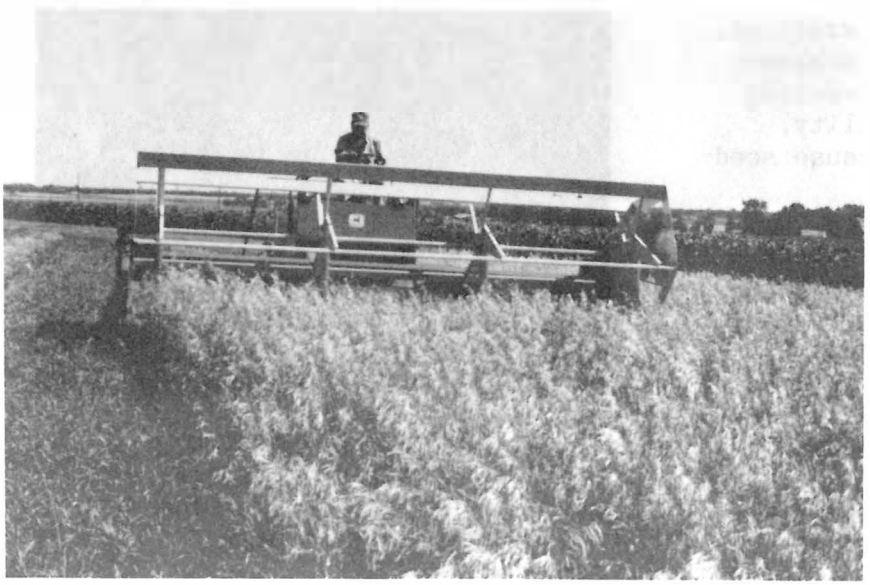

Fig 4. Windrowing, curing in the field, and pickup combining lowers moisture content and eliminates costly drying.

storage conditions (Ching and Calhoun, 1960). Generally, dry and cool conditions are best for seed storage. High relative humidity and temperature conditions should be avoided. Seed combined directly may need to be dried before it can be safely stored.

Some seed may be moved directly into the market soon after it is cleaned. However, when market conditions dictate that long-term storage, proper seed moisture and storage conditions should be provided. When stored at 19 and 0° F for 20 years, seed viabilities of 80 to 90% have been demonstrated for crested wheatgrass, intermediate wheatgrass, and smooth bromegrass (Ackigoz and Knowles, 1983).

Conditioning

Harvested seed may contain damaged seed, contaminants, and other trash that must be removed before marketing. Seed conditioning removes these impurities. Specialized equipment is required for seed conditioning, and this process is not usually performed by the seed producer. Impurities can be separated from grass seed based on physical properties such as size, weight, shape, and color.

In the seed conditioning process, the greatest concern is weed seed contaminants with physical characteristics similar to grass seed. These contaminants may not be totally removed during seed conditioning.

Some grass species such as big bluestem must be run through a hammer mill to reach a high degree of purity. This removes awns and breaks up inert material. It is especially important if the seed is to be planted without the use of a grassland drill.

Purity

The Federal Seed Act and state laws require specific information on a label attached to each bag of seed. This includes name of crop, percentage of pure seed, inert matter, other crop seed, weed seed, and germination. State laws also list the amount of prohibited and noxious weeds as prescribed for that state.

Grass seed should be bought and sold on a pure live seed basis. Pure live seed is calculated by multiplying germination percentage by seed purity. Purity indicates the amount of seed free of contaminants and other impurities. Germination percentage indicates the amount of seed germinated during a seed laboratory test period.

Pure live seed provides a good indication of the actual amount of seed with the potential to produce a crop. Pure live seed values should be used when comparing seed prices and determining seeding rates.

GRASS SEED CERTIFICATION STANDARDS

Seed Certification maintains and makes available sources of high quality seed of superior varieties grown and distributed to insure high genetic and mechanical purity standards. Certified seed is more readily accepted in the seed industry.

Seed Source

To produce **CERTIFIED** seed a grower must first produce and plant eligible **FOUNDATION** seed stock on eligible land.

Isolation Distance

For the field to be certified it must be 165 ft from any other strain or strains of the same species in bloom at the same time. Some modification to this standard may be made at harvest by cutting a border from the certified field. Refer to South Dakota Seed Certification Standards.

Land Requirements

A field eligible for the production of certified seed must not have grown or been seeded to the same species during the previous year, unless the crop was a

certified class of the same variety or strain and had passed field inspection. Fields must be rogued prior to harvest to remove off-type plants and other grasses or weeds whose seeds cannot be separated by mechanical equipment.

Field Inspection

A field inspection must be made each year a certified seed crop is harvested. The field will be inspected by a representative of the South Dakota Crop Improvement Association after the crop is fully headed, but before it is cut.

Seed Standards

Specific seed standards for foundation (F), and certified (C) seed of several grass species are shown in Appendix 2.

For more information about seed certification and instructions on how to apply for field inspection, contact the South Dakota Crop Improvement Association.

ECONOMICS OF GRASS SEED PRODUCTION

Grass seed ~~economics~~ Production is not predictable. It depends upon weather, production costs, governmental programs, and the presence of weeds and damaging insects. Each of the above may cause loss of profitability in the grass seed production enterprise.

Because of this, producers are advised not to depend solely on grass seed production as their major source of income. If the production of grass seed is appropriate for your operation, the following concerns should be taken into account.

Production Costs

The initial investment to begin grass seed production is dependent upon where the field is located, the condition of the soil, the proposed crop to be planted, and the presence/absence of weeds, crop residues, etc. Obviously, whether it is a new or a revitalized stand of existing grass make a difference in initial investment.

Producers developing a new stand of a warm-season grass need to realize that warm-season grasses planted May through June will not produce seed until the next fall. This could result in cash flow problems for some producers.

Variability in Yields and Costs

One of the greatest concerns in the profitability of grass seed production is the variability in grass seed yields and the prices which producers receive. Table 1 presents information on the variability of prices of certain grass and legume seeds. Refer to Appendix 1 for information on the variability of yields.

Weather plays a major role in yields and profits. If seed production is on a dryland basis, it is conceivable lack of water may limit seed production to only two or three out of five years. Unless you can use the forage in another manner, the seed production enterprise will not be economically viable in the long run. If you can hay or graze the forage during dry years, you will recoup some, if not a majority, of the production costs.

Grass Seed Supply and Demand

The CRP's goal is to have between 40 and 45 million acres enrolled by the 1990 crop year. In the 1986 sign-up, approximately 8.9 million acres were enrolled (Dicks, et al. 1987). In the February 27, 1987, sign-up period, the USDA allowed an additional 10.5 million acres (Commodity News Service, 1987). A sizeable amount of erroded land will be planted to permanent grass.

Currently, 1.3 million acres of land are eligible for the CRP program in South Dakota (Dakota Farmer, 1987). Before the February sign-up period, 224,869 acres in South Dakota had been enrolled (Dicks, et al. 1987). This should sustain the current high demand for grass seed listed as acceptable for

planting in the CRP program in the near future. The currently accepted grasses for South Dakota are listed in Table 2.

No recent data are available estimating the number of acres of land placed in grass seed production in South Dakota. However, given the apparent profitability of grass seed production, entry into the market by many producers is likely. This will increase grass seed supplies in the years ahead, resulting in lower grass seed prices.

Marketing Concerns

As with any alternative agricultural enterprise, the first pre-planting step is to evaluate the market for grass seed in your area.

Marketing includes cleaning, blending, seed treating, bagging, testing, labeling, advertising, selling, and shipping. These functions may be performed by a local seed dealer or major seed company after the producer has sold the seed. This relieves the

Table 1. Price Variability of Farm Level Prices for Selected South Dakota Grass and Legume Seeds.[a]

Type of Grass or Legume	Normal Year ($/lb.)		1986 ($/lb.)	
	Low	High	Low	High
Crested Wheatgrass	$ 0.50	$ 0.75	$ 1.00	$ 2.50
Intermediate Wheatgrass	0.40	0.70	1.50	2.00
Pubescent Wheatgrass	0.40	0.70	1.50	2.00
Western Wheatgrass	0.70	1.00	2.00	3.00
Green Needlegrass	0.50	1.00	2.00	3.00
Tall Wheatgrass	$0.40 ave.		$1.00 ave.	
Sideoats Grama	$1.50 ave.		8.00	12.00
Alfalfa	0.70	1.00	0.70	1.00
Big Bluestem	1.00	2.00	3.00	6.00
Indiangrass	1.00	2.00	3.00	6.00
Switchgrass	$0.15 ave.		7.00	8.00
Sweetclover	0.12	0.20	0.25	0.30
Reed Canarygrass	0.75	1.00	1.25	2.50
Garrison Creeping Foxtail	0.50	1.50	1.00	2.50

[a]Source: telephone survey of elevator operators in South Dakota.

Table 2. Grasses and Legumes Eligible for the Conservation Reserve Program in South Dakota (March, 1987).[a]

Intermediate Wheatgrass	Big Bluestem	Alfalfa
Pubescent Wheatgrass	Indiangrass	Sweetclover
Western Wheatgrass	Switchgrass	Sideoats Grama
Tall Wheatgrass	Green Needlegrass	Reed Canarygrass
Garrison Creeping Foxtail	Smooth Bromegrass	

[a]Contact your local ~~ASCS~~ SCS office for mix of species required and seeding rates for your area concerning the planting of CRP acreage.

grower from acquiring seed cleaning equipment, providing storage, obtaining seed laboratory analysis, and acting as seller in the retail market.

Consult with local elevators and other commercial seed dealers about seed marketing. If possible, consider contracting production, agreeing to produce seed within a given price range, and delivering the seed to the contracting company within a specified period of time.

Contracting is limited to specific crops and varieties and in areas of concentrated production, associations or cooperatives may be available to market seed.

Plan the marketing of seed at the same time production considerations are made.

Cost and Return

Grass seed crop costs and returns vary across the state. Estimate these costs and returns for your own situation. Tables 3-5 contain items to consider in determining the total cost per acre in establishing a new stand of grass and in determining yearly production costs and returns.

The establishment year costs depend upon previous cropping patterns and your production practices. These costs can be allocated over the life of the stand. In evaluating the costs and returns, remember to include all indirect costs such as interest, depreciation, land charge, etc. A grass seed enterprise should "pay its own way."

Tables 6 and 7 list estimated net returns from price and yield combinations for the production of intermediate wheatgrass and switchgrass. These net returns were computed utilizing a computerized budget generator following recommended dryland production practices. They do not represent information from an actual grass seed production study. Take care when applying these results to your farm.

The net return values in Tables 6 and 7 indicate that, given current high grass seed prices and adequate yields, the production of grass seed may be profitable for some producers. However, as more producers enter the market and more seed is produced, grass seed prices will fall. Grass seed producers must emphasize efficient production methods to minimize costs and remain competitive in the long run.

Table 3. Establishment Year Production Costs per Acre.

	Dollars
Seedbed Preparation (primary tillage, disking, packing)	_____.__
Seed	_____.__
Planting (drill rental)	_____.__
Fertilizer	_____.__
Herbicide	_____.__
Cultivation	_____.__
Rouging	_____.__
Irrigation (Water costs, ditch and/or sprinkler maintenance)	_____.__
Taxes	_____.__
Interest on Operating Capital	_____.__
Interest on Machine Investment	_____.__
Depreciation and Insurance	_____.__
Labor	_____.__
Land Charge	_____.__
Total Cost of Establishment (Allocate over life of stand, 4 or 5 years)	_____.__

Table 4. Yearly Production Costs.

	Dollars
Fertilizer	_____.__
Herbicide	_____.__
Cultivation	_____.__
Rouging	_____.__
Irrigation (Water costs, ditch	_____.__
and/or sprinkler maintenance)	_____.__
Windrowing	_____.__
Combine	_____.__
Certification Costs	_____.__
Taxes	_____.__
Interest on Operating Capital	_____.__
Interest on Machine Investment	_____.__
Depreciation and Insurance	_____.__
Labor	_____.__
Land Charge	_____.__
Establishment Year Allocated Cost	_____.__
If Applicable	
Drying	_____.__
Handling	_____.__
Storage	_____.__
Cleaning	_____.__
Bagging	_____.__
Total Annual Costs	_____.__

Table 5. Expected Return per Acre.

	Dollars
Expected Yield (lbs/acre)	_____.__
Expected Price per lb.	
Farm Level or Retail	_____.__
Aftermath and Straw Value	_____.__
Expected Gross Income	_____.__
Total Annual Costs	_____.__
Net return per acre	_____.__

Table 6. Net Returns per Acre for Intermediate Wheatgrass Seed Production.[a]

Farm Level Price per lb.	Yield (lbs/Acre) 250	300	350	400	450	500	550
	$/Acre						
$ 0.20	(66)[b]	(56)	(46)	(36)	(26)	(16)	(6)
0.30	(41)	(26)	(11)	3	18	33	48
0.40	(16)	3	23	43	63	83	103
0.50	8	33	58	83	108	133	158
0.60	32	62	92	122	152	182	212
0.75	70	107	145	182	220	257	295
1.00	132	182	232	282	332	382	432
1.50	256	331	406	481	556	631	706
2.00	380	480	580	680	780	880	980

[a] These values were calculated using a computerized budget generator. Your estimated returns per acre will depend on your production practices, estimated costs, yields, and seed price.

[b] Values in parenthesis are negative.

Switch Grass

Table 7. Net Returns per Acre for Seed Production.[a]

Farm Level Price per lb.	Yield (lbs/Acre) 200	250	300	350	400	450	500
	$/Acre						
$ 0.10	(62)[b]	(57)	(52)	(47)	(42)	(37)	(32)
0.15	(52)	(44)	(37)	(29)	(22)	(14)	(7)
0.20	(42)	(32)	(22)	(12)	(2)	7	17
0.25	(32)	(20)	(7)	5	18	30	43
0.50	17	42	67	92	117	142	167
0.75	67	104	142	179	217	253	292
1.00	116	166	216	266	316	365	415
2.00	315	415	515	615	715	815	915
4.00	713	913	1113	1313	1513	1713	1913

[a] These values were calculated using a computerized budget generator. Your estimated returns per acre will depend on your production practices, estimated costs, yields, and seed price.

[b] Values in parenthesis are negative.

Appendix 1: Seed Production Guides for Individual Species.

Species	Planting			Harvesting		Species Characteristics[3]
	Rate[1] lbs/A	Row Spacing inches	Date[2]	Stage	Yield lbs/A	
Cool-Season Species						
Smooth Bromegrass	3	30-48	ESP/LSM	hard dough	250-500	2
Creeping Foxtail	1.5	36 plus	"	when majority of panicles are black	100-300	4,6
Reed Canarygrass	2.0	"	"	when 50% of seeds are brown	100-400	4,6
Green Needlegrass	2.5	30-48	Dormant	when shatter starts at top of panicle	150-350	4
Crested Wheatgrass	2.5	24-48	ESP/LSM	hard dough	100-400	3
Intermediate Wheatgrass	4.0	30-48	"	hard dough	250-600	3
Tall Wheatgrass	5.0	30-48	"	hard dough	"	3
Slender Wheatgrass	3.0	24-48	ESP/LSM	hard dough	200-400	3
Western Wheatgrass	3.0	30-48	Dormant	hard dough	150-300	3
Russian Wildrye	2.5	24-48	ESP/LSM	hard dough	150-400	3

Appendix 1. (continued)

Species	Planting Rate[1] lbs/A	Planting Row Spacing inches	Planting Date[2]	Harvesting Stage	Harvesting Yield lbs/A	Species Characteristics[3]
Warm-Season Species						
Switchgrass	2.0	30-48	Spring	when tips of panicles shatter	200-500	3,5,6
Big Bluestem	3.0	"	"	hard dough	150-400	1,3,5,6,7
Little Bluestem	2.0	30-48	Spring	hard dough	100-250	1,3,5,6,7
Indiangrass	3.0	"	"	hard dough	150-500	1,3,5,6,7
Sideoats Grama	2.5	30-48	Spring	hard dough	100-300	1,3,5,6

[1] Seeding rate at 36-inch row spacing; multiple by 0.75 to obtain rate for 48-inch row spacing, etc.; 25-30 seeds/linear foot of row for all spacings.

[2] ESP - early spring, before April 15.
LSM - late summer, between August 15 and September 15.
Spring - May 15 to July 1.
Dormant - after November 15 or just prior to freeze up.

[3] 1 = hairy seed units difficult to plant; 2 = prone to lodging; 3 = moderate shattering; 4 = severe shattering; 5 = use only adapted varieties; 6 = drying usually necessary; 7 = special cleaning and/or processing necessary.

SOURCES: Wheeler and Hill, 1957; Atkins and Smith, 1967; Holzworth and Wiesner, 1985; SD Exp. Stn. data 1961-1986.

Appendix 2. Seed Certification Standards.

Specific Seed Standards (Non-Chaffy Seeded Species)

Other varieties (maximum)..... Foundation .1% Registered 1.0% Certified 2.0%

Species	Type of Reproduction	MINIMUM			MAXIMUM											
		Percent Pure Seed		Percent Germination	Percent Other Crop		Percent Other Grass		Percent Inert Matter		Prohibited Weed Seed	Restricted Noxious Weed Seed		Percent Total Weed Seed		Percent Annual Bromes†	
		F	C	All Classes	F	C	F	C	F	C	All Classes	F	C	F	C	F	C
Bromegrass	C	90	85	80%	1.0	1.0	0.1	2.0	10	15	None	9/lb.	45/lb.	.25	1.0	.15	0.5
Crested Wheatgrass.	C	90	90	80	0.2	1.0	0.1	2.0	10	10	None	9/lb.	45/lb.	.25	.5	.15	0.5
Pubescent Wheatgrass.....	C	90	90	80	0.2	1.0	0.1	2.0	10	10	None	9/lb.	45/lb.	.25	.5	.15	0.5
Slender Wheatgrass.	S	90	90	80	0.2	1.0	0.1	2.0	10	10	None	9/lb.	45/lb.	.25	.5	.15	0.5
Intermediate Wheatgrass.....	C	90	90	80	0.2	1.0	0.1	2.0	10	10	None	9/lb.	45/lb.	.25	.5	.15	0.5
Tall Wheatgrass....	C	90	90	80	0.2	1.0	0.1	2.0	10	10	None	9/lb.	45/lb.	.25	.5	.15	0.5
Western Wheatgrass.	C	85	85	60	0.2	1.0	0.1	2.0	15	15	None	9/lb.	45/lb.	.25	.5	.15	0.5
Canada Wildrye....	S	90	85	70	0.2	1.0	0.1	2.0	10	15	None	9/lb.	45/lb.	.25	.5	.15	0.5
Russian Wildrye ...	C	90	90	80	0.2	1.0	0.1	2.0	10	10	None	9/lb.	45/lb.	.25	.5	.15	0.5
Timothy	C	99	97	80	0.2	0.5	0.1	2.0	1	3	None	9/lb.	45/lb.	.25	.5	.15	0.5
Feather Bunchgrass.	S	80	80	*	0.2	1.0	0.1	2.0	20	20	None	9/lb.	45/lb.	.25	.5	.15	0.5
Creeping Foxtail ...	C	75	70	80	0.2	1.0	0.1	2.0	20	20	None	9/lb.	45/lb.	.25	.5	.15	0.5
Orchardgrass	C	85	85	80	0.2	1.0	0.1	2.0	15	15	None	9/lb.	45/lb.	.25	.5	.15	0.5
Reed Canarygrass ..	C	95	90	75	0.2	1.0	0.1	2.0	5	10	None	9/lb.	45/lb.	.25	.5	.15	0.5
Switchgrass	C	90	90	50	0.2	1.0	0.1	2.0	10	10	None	9/lb.	45/lb.	.25	1.0	.15	0.5

*Untreated (awned)—15%
*Treated (dewned)—65%

†Japanese chess, hairy chess, downy brome, cheat

Source: South Dakota Seed Certification Standards. The South Dakota Crop Improvement Association. Box 2207-A. Brookings, South Dakota 57007.

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