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PURE
LIVE
SEED

METHOD FOR
DETERMINING REQUIREMENTS
FOR GRASS SEEDINGS

EXTENSION SERVICE
UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE
AND U. S. DEPARTMENT OF AGRICULTURE
COOPERATING
E. F. FROLIK, DEAN E. W. JANIKE, DIRECTOR

PURE LIVE SEED (PLS) METHOD

FOR DETERMINING REQUIREMENTS FOR GRASS SEEDINGS

D. F. Burzlaff and J. C. Swinbank^{1/}

The "Pure Live Seed" Method

Grass seed lots may vary widely in quality and price. Some lots of seed--especially native grasses--contain inert material, undesirable mixtures, weed seeds, and grass seeds that will not grow. Since only live seeds of the desired crop are of value, the pure live seed way is the business-like way to buy, plant and sell grass seed. It assures farmers and ranchers of full value for their seed dollar and protects producers and handlers of high quality seed against price penalties experienced in competition with low quality seed priced without regard to purity and germination. Pure live seed planting rates supply the desired number of live seeds per acre and better stands can be expected.

The term "pure live seed" (PLS) refers to the amount of live seed of the desired crop which is present in any lot of seed material. The percentage of pure live seed present is determined by multiplying the purity times the germination. Seed, if properly labeled, will have information attached to show the purity, germination, weed seeds, hard seeds, other crop seed, and inert matter. Thus, the seed tag supplies the information needed to plan seeding mixtures on a pure live seed basis.

Calculating Mixtures on a PLS Basis

Calculating mixtures for grass seedings need not be difficult or confusing. Actually, this is not different from determining the amount of crude protein in a 100-pound bag of 40% protein supplement. Similar calculations are performed each time you decide how many pounds of a 45% fertilizer are needed to apply 100 pounds of the needed element. This circular has been prepared to acquaint you with the procedure for making grass-seeding calculations on the basis of pure live seed content.

Each County Extension Office, in cooperation with the Soil Conservation Service and the County ASC Committee, should develop basic mixtures of desirable grasses for each site in the county. An example of a set of mixtures and rates of seeding is presented in Table 1. These seeding rates are determined on the basis of approximately 20 live seeds per square foot.

Any grass included in a mixture should be adapted to the soils and climate of the area. Table 2 shows many of the grasses recommended for seeding in Nebraska. The areas of the state in which each grass is adapted for production are indicated.

Table 2 shows the approximate number of pounds of PLS of each grass that must be seeded to assure at least 20 live seeds per square foot. This information is used in determining the amount of each species to be included in the mixture.

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To see how mixtures are formulated refer to Table 1. Here is an example from Table 1 of the first choice mixture for hardland sites in Sherman County:

Species	% of Mixture	Lbs. PLS Per Acre
Little bluestem	30	1.1
Side-oats grama	20	1.0
Western wheatgrass	20	1.6
Switchgrass	30	1.0
		<u>4.7</u>

The percentage figures represent the amount of each grass in the mixture. The amount of each species included depends upon what composition is desired in the forage to be produced. If legumes are included, they usually do not represent more than 20 percent of a forage mixture.

The pounds of PLS per acre are determined by multiplying the percentage figure for each species by the number of pounds of PLS required to make a full seeding (Table 2).

In the above example:

Little bluestem	30%	x	3.5	=	1.05 or 1.1* lbs. PLS per acre
Side-oats grama	20%	x	4.5	=	.90 lb. or 1.0* lb. PLS per acre
Western wheatgrass	20%	x	8.0	=	1.6 lbs. PLS per acre
Switchgrass	30%	x	3.0	=	.90 lb. or 1.0* lb. PLS per acre

Planning Seedings on a PLS Basis

When planning a grass seeding, first consider the purpose of the seeding and the site on which it is to be made. Then select the proper mixture from the list of grass seeding mixtures developed for your county.

Let us assume, for example, that you desire to make a seeding on 40 acres of land. After some consideration you select the following basic mixture:

Species	Percent of Each Species In Mixture	Pounds PLS Per Acre
Little bluestem	50%	1.8
Side-oats grama	25%	1.2
Blue grama	15%	.3
Western wheatgrass	10%	.8

* When computing seeding rates, always remember to increase any fractional value to the next highest tenth of a pound.

To determine the amount of PLS required for the seeding, multiply the number of acres to be seeded times the pounds of PLS required per acre for each species. This would give you the following information:

Grass Mixture		Lbs. PLS/Acre	Acres to be seeded	Pounds PLS to be purchased
Little bluestem	50%	1.8	40	72
Side-oats grama	25%	1.2	40	48
Blue grama	15%	.3	40	12
Western wheatgrass	10%	.8	40	32

Take this information to the seed dealer to determine the amount of bulk seed you need to get the required amount of pure live seed. The amount is determined by applying the information on the seed tag to the information in Table 3.

For the example above assume the following seed quality:

Species	Purity	Germination
Little bluestem	50%	60%
Side-oats grama	40%	50%
Blue grama	55%	60%
Western wheatgrass	80%	80%

To determine the amount of little bluestem to purchase from seed of the above quality, find "50" in the column headed "purity." Follow horizontally along this line to the column for the germination percentage of 60. At this point of intersection is found the number 3.4. This means for every pound of PLS desired, 3.4 pounds of material must be purchased. For this seeding it would require 3.4×72 , or approximately 245 pounds of little bluestem.

This procedure is repeated for each species in the mixture, using their respective purity and germination values. The seed requirements for making your grass seeding would be:

Little bluestem	245 pounds
Side-oats grama	240 pounds
Blue grama	37 pounds
Western wheatgrass	52 pounds
	<u>574 pounds total</u>

PLS and Native Harvested Mixtures of Grasses

What procedure must be followed when a seeding is planned that consists of a native grass mixture? This mixture may be harvested mixture or a mixture made by the seed dealer.

The components of the mixture with the purity and germination values for each must be known at the time the seeding is planned. This means there must be a seed analysis available on all locally harvested seed.

Assume in the above situation that little bluestem seed is not available except in a native harvested mixture. This mixture could be of the following analysis:

	Purity	Germination	PLS
Little bluestem	35.6%	52%	18.5%
Big bluestem	5.2%	51%	2.5%
Side-oats grama	5.1%	60%	3.1%
Inert and foreign matter	54.1%	--	--

This analysis tells us that in each 100 pound bag of this mixture there are 18.5 pounds of little bluestem (PLS), 2.5 pounds of big bluestem (PLS), and 3.1 pounds of side-oats grama (PLS).

Since big bluestem is adapted to this site, it may be substituted for some of the little bluestem in the mixture. In this case 21 pounds of big bluestem and little bluestem (PLS) would be available in each 100 pounds of bulk material. The seeding called for 68 pounds PLS of little bluestem. Using the above mixture it would require 325 pounds of bulk material to provide this amount of pure live seed. In addition this 325 pounds would furnish 10 of the necessary 48 pounds PLS of side-oats grama.

Determining the Cost of Pure Live Seed

Traditionally, grass seed prices have been quoted on the bulk seed basis. However, because of widespread interest in the pure-live seed method many dealers are now quoting on a PLS basis.

The cost of the pure live seed in any bulk seed lot can be determined by multiplying the purity times the germination and dividing the result into the bulk seed price. Here is the formula:

$$\frac{\text{Bulk Seed Price}}{\text{Purity} \times \text{Germination}} = \text{Cost of Pure Live Seed}$$

Example:

Step 1 -- Substitute appropriate figures in the formula:

$$\frac{\text{Bulk Seed Price } 75\text{¢/lb.}}{50\% \text{ (Purity)} \times 60\% \text{ (Germination)}} = \text{Cost of PLS}$$

Step 2 -- Determine the cost of PLS:

$$\frac{\$0.75}{.50 \times .60} = \frac{\$0.75}{.3000} = \$2.50 \text{ for each pound of Pure Live Seed}$$

This formula provides a means of comparing the "actual" or "real" value of different lots of seed. The price per pound of pure live seed and not the bulk seed price determines which seed lot is the better buy.

Farmers who buy grass seed on a pure live seed basis for the first time may be concerned because the price per pound of pure live seed is greater than that of bulk seed. As the formula shows, the cost of the seed that will grow is no greater and in many cases may be less than that offered at a low bulk seed price. It should also be borne in mind that pure live seed planting rates are based on the amount of live seed needed to give the desired stand.

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Table 1. (Example) Suggested Seeding Mixtures
For
Sherman County

<u>1st CHOICE</u>			<u>2nd CHOICE</u>			<u>3rd CHOICE</u>		
Species	Percent of Mixture	PLS Lbs/Acre	Species	Percent of Mixture	PLS Lbs/Acre	Species	Percent of Mixture	PLS Lbs/Acre
<u>Hardland</u>			<u>Hardland</u>			<u>Hardland</u>		
Little bluestem	30	1.1	Switchgrass	25	.8	Western wheatgrass	20	1.6
Side-oats grama	20	1.0	Big bluestem	25	1.5	Intermediate wheatgrass		6.0
Western wheatgrass	20	1.6	Indian grass	25	1.3	or Bromegrass	60	3.9
Switchgrass	30	<u>1.0</u>	Side-oats grama	25	<u>1.2</u>	Alfalfa	20	<u>.8</u>
		4.7			4.8			6.3 or 8.4
<u>Sandyland</u>			<u>Sandyland</u>			<u>Sandyland</u>		
Sand bluestem	30	2.4	Switchgrass	50	1.5	Sand lovegrass	40	.6
Switchgrass	30	1.0	Sand lovegrass	50	<u>.5</u>	Intermediate wheatgrass	40	4.0
Prairie sandreed	20	.7			2.0	Alfalfa	20	<u>.8</u>
Sand lovegrass	20	<u>.2</u>						5.4
		4.3						
<u>Wetland</u>			<u>Wetland</u>			<u>Wetland</u>		
Big bluestem	25	1.5	Reed canarygrass	40	.8	Tall wheatgrass	50	5.5
Indian grass	25	1.3	Bromegrass	40	2.6	Switchgrass	50	<u>1.5</u>
Switchgrass	30	1.0	Redtop	20	<u>.1</u>			7.0
Red clover	20	<u>.7</u>			3.5			
		4.5						

Table 2. Grasses commonly seeded for the establishment of permanent cover in Nebraska and recommended planting rates in terms of pure-live-seed.

(Select a grass mixture which will result in about 20 live seeds per square foot--select column applicable to area of the state and the site condition.)

Eligible Grasses and Legumes	Eastern			Central			Western			1/Required Pounds Pure-Live-Seed Per Acre (to plant approximately 20 live seeds per sq. ft.)
	Hard-land	Sandy	Wet	Hard-land	Sandy	Wet	Hard-land	Sandy	Wet	
Bromegrass	-	-	-	-	-	-			-	6.5
Tall fescue	-		-			-			-	4.0
Orchardgrass	-	-	-			-			-	2.0
Intermediate wheatgrass	-	-		-	-		-	-		10.0
Tall wheatgrass	-		-	-		-			-	11.0
Crested wheatgrass				-	-		-	-		5.0
Russian wildrye				-			-			5.0
Redtop			-			-			-	.4**
Blue grama	-	-		-	-		-	-		1.5
Side-oats grama	-	-		-	-		-	-		4.5
Buffalo grass				-			-			4.0*
Sand bluestem		-			-			-		8.0
Big bluestem	-	-	-	-	-	-		-	-	6.0
Little bluestem	-	-		-	-		-	-		3.5
Indian grass	-	-	-	-	-	-		-	-	5.0
Switchgrass	-	-	-	-	-	-		-	-	3.0
Sand lovegrass	-	-		-	-			-		1.0
Prairie sandreed		-			-			-		3.5
Green needlegrass				-	-		-	-		5.0
Slender wheatgrass				-			-			5.5
Western wheatgrass	-	-		-	-	-	-	-	-	8.0
Canada wildrye		-		-	-		-	-		7.5
Reed canarygrass	-		-			-			-	2.0
Alfalfa	-	-		-	-	-	-	-	-	4.0
Sweet clover	-	-	-	-	-	-	-	-	-	3.5
Red clover	-	-	-			-			-	3.5
Alsike clover			-			-			-	1.5
Birdsfoot trefoil	-	-	-			-			-	2.5
Hairy vetch	-	-		-	-			-		24.0***
Lespedeza	-	-								4.0

* Based on treated seed at the rate of approximately 4 pure live burs per square foot.

** Provides for approximately 40 pure live seeds per square foot.

*** Provides for approximately 10 pure live seeds per square foot.

1/ A planting rate of 20 pure live seeds per square foot is considered adequate under good conditions of seedbed preparation and weather. Somewhat higher rates are suggested where obtaining a full, usable stand in a minimum time justifies the added cost.

Table 3. Pounds of Grass Seed Material Required to Yield One Pound of Pure Live Seed

% Purity	Percent Germination																		
	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25	20	15	10
100	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.3	2.5	2.9	3.4	4.0	5.0	6.7	10.0
95	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.2	2.4	2.7	3.1	3.6	4.3	5.3	7.1	10.6
90	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.8	1.9	2.1	2.3	2.5	2.8	3.2	3.8	4.5	5.6	7.5	11.2
85	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.9	2.0	2.2	2.4	2.7	3.0	3.4	4.0	4.8	5.9	7.9	11.8
80	1.3	1.4	1.4	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.5	2.8	3.2	3.6	4.2	5.0	6.3	8.4	12.5
75	1.4	1.5	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.5	2.7	3.0	3.4	3.9	4.5	5.4	6.7	8.9	13.4
70	1.5	1.6	1.6	1.7	1.8	2.0	2.1	2.2	2.4	2.6	2.9	3.2	3.6	4.1	4.8	5.8	7.2	9.6	14.3
65	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.6	2.8	3.1	3.5	3.9	4.4	5.2	6.2	7.7	10.3	15.4
60	1.7	1.8	1.9	2.0	2.1	2.2	2.4	2.6	2.8	3.1	3.4	3.8	4.2	4.8	5.6	6.7	8.4	11.2	16.7
55	1.9	2.0	2.1	2.2	2.3	2.5	2.6	2.8	3.1	3.4	3.7	4.1	4.6	5.2	6.1	7.3	9.1	12.2	18.2
50	2.0	2.2	2.3	2.4	2.5	2.7	2.9	3.1	3.4	3.7	4.0	4.5	5.0	5.8	6.7	8.0	10.0	13.4	20.0
45	2.3	2.4	2.5	2.7	2.8	3.0	3.2	3.5	3.8	4.1	4.5	5.0	5.6	6.4	7.5	8.9	11.2	14.9	22.3
40	2.5	2.7	2.8	3.0	3.2	3.4	3.6	3.9	4.2	4.6	5.0	5.6	6.3	7.2	8.4	10.0	12.5	16.7	25.0
35	2.9	3.1	3.2	3.4	3.6	3.9	4.1	4.4	4.8	5.7	5.8	6.4	7.2	8.2	9.6	11.5	14.3	19.1	28.6
30	3.4	3.6	3.8	4.0	4.2	4.5	4.8	5.2	5.6	6.1	6.7	7.5	8.4	9.6	11.2	13.4	16.7	22.3	33.4
25	4.0	4.3	4.5	4.8	5.0	5.4	5.8	6.2	6.7	7.3	8.0	8.9	10.0	11.5	13.4	16.0	20.0	26.7	40.0
20	5.0	5.3	5.6	5.9	6.3	6.7	7.2	7.7	8.4	9.1	10.0	11.2	12.5	14.3	16.7	20.0	25.0	33.4	50.0
15	6.7	7.1	7.5	7.9	8.4	8.9	9.6	10.3	11.2	12.2	13.4	14.9	16.7	19.1	22.3	26.7	33.4	44.5	66.7
10	10.0	10.6	11.2	11.8	12.5	13.4	14.3	15.4	16.7	18.2	20.0	22.3	25.0	28.6	33.4	40.0	50.0	66.7	100.0

The information in Table 3 is in 5% gradations. Seed analyses seldom come out as a whole number ending in "0" or "5". It is sufficiently accurate to use the nearest whole number. For example: 37.50% to 42.49% would be considered as 40%. 42.50% to 47.49% would be considered as 45%.