

Kansas Crop Planting Guide

Kansas is agronomically rich, with diverse soils and growing conditions. The average number of freeze-free days each year ranges from 150 days in the northwest to 200 days in southeastern Kansas. The average date of the last 32-degree-Fahrenheit freeze in the spring is May 5 in the northwest and April 10 in the southeast (Figure 1). The average date of the first 32-degree-Fahrenheit fall freeze is October 5 for the northwest and October 25 for the southeast (Figure 2).

Rich soils and climatic conditions make Kansas a top producer of wheat and grain sorghum. These conditions not only dictate the crops that will grow but also

cause wide differences in the optimum planting dates and seeding rates across the state. It is important that producers determine optimum planting dates and rates for various crops, but just as important, producers need to understand the differences between growing conditions on their farms and those of their neighbors.

Tables in this publication show ranges of optimum planting rates and dates for various crops commonly grown in Kansas. All data in this publication are based on historical averages and are a foundational recommendation, not a precise value. Seasonal and situational adjustments influence crop success.

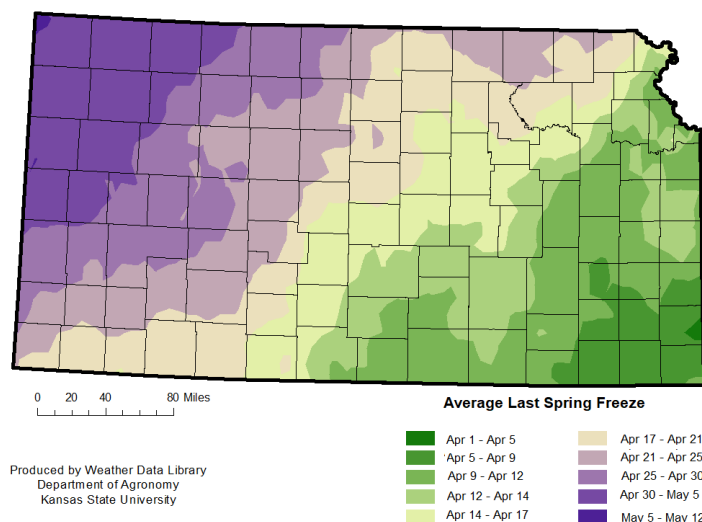


Figure 1. Average last spring freeze at 32°F from 1991-2020 data.

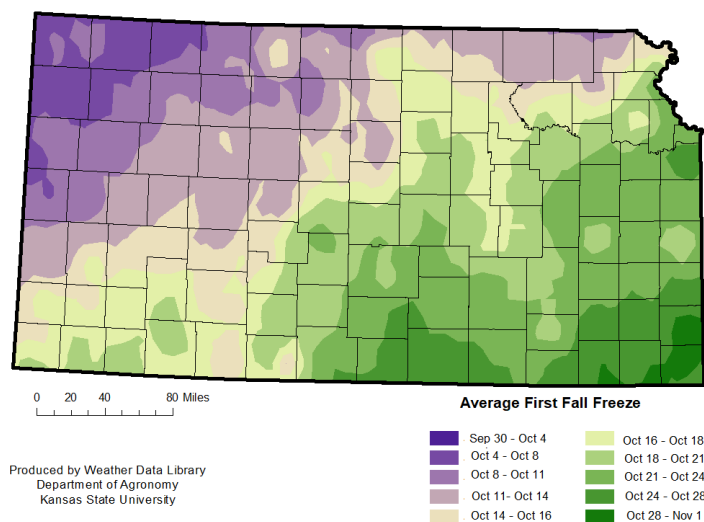


Figure 2. Average first fall freeze at 32°F from 1991-2020 data.

Planting Dates

Generally, the earlier planting dates of the planting range are for spring-planted crops in eastern and southern areas, while for fall-planted crops, they apply to northern and western areas (Table 1)(Figure 3). It is important to note that the provided dates are general suggestions based on historical trends in weather data. The best course of action is to regularly monitor soil conditions for your specific location. Base temperatures required for germination and healthy development vary by crop (for example, 50 degrees Fahrenheit for corn and soybean, and 60 degrees Fahrenheit for cotton). Tools are available on the Kansas Mesonet website (<https://mesonet.k-state.edu/>) to help producers with year-to-year planting date decisions. Late

planting dates may require adjustments to other management practices, such as changes in planting rates.

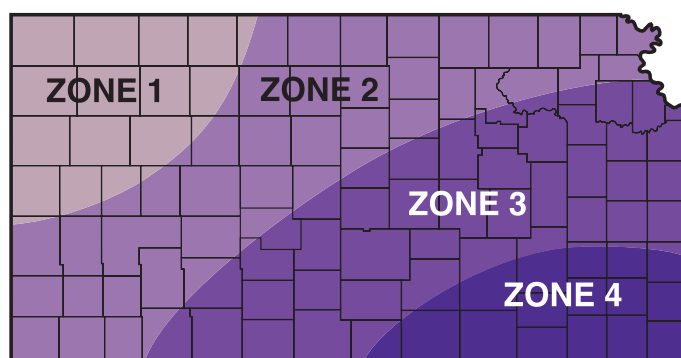


Figure 3. Kansas planting date zones.

Table 1. Suggested planting dates for major Kansas crops (based on historic recommendations)

	Zone 1	Zone 2	Zone 3	Zone 4
Wheat (winter)	Sept 10 – Sept 30	Sept 15 – Oct 20	Sept 25 – Oct 20	Oct 5 – 25
Corn (grain)	Apr 20 – May 20	Apr 15 – May 20	Apr 01 – May 10	Mar 25 – Apr 25
Soybean	May 10 – June 1 (irr ¹)	Apr 25 – June 1	Apr 25 – June 15	Apr 15 – June 25
Sorghum (grain)	May 15 – June 10	May 15 – June 20	May 15 – June 20	May 01 – June 25
Cotton		May 01 – June 05	May 01 – June 05	May 01 – June 05
Sunflower	May 07 – June 20	May 15 – July 10	May 10 – July 10	June 10 – July 15
Barley (winter)	Sept 10 – Sept 20	Sept 10 – Oct 05	Sept 15 – Oct 10	Sept 20 – Oct 10
Canola (winter)	Aug 25 – Sept 20	Sept 1 – Sept 25	Sept 1 – Sept 30	Sept 15 – Oct 05
Oat (spring)	Mar 05 – Mar 20	Feb 25 – Mar 15	Feb 25 – Mar 15	Feb 20 – Mar 15
Millet	June 1 – July 1	June 1 – July 1	June 1 – July 1	June 1 – July 1
Forage/Silage				
Corn (silage)	Adjust from grain corn dates based on target CRM ² to reach milkline before fall frost			
Alfalfa ³	Aug 10 – Aug 30 (Apr 25 – June 01)	Aug 15 – Sept 10 (Apr 20 – May 10)	Aug 15 – Sept 10 (Apr 10 – May 10)	Aug 15 – Sept 15 (Apr 10 – May 10)
Sorghums (silage)	May 15 – July 01	May 20 – July 10	May 20 – July 10	May 20 – July 10
Barley (spring)	Feb 25 – Mar 15	Feb 25 – Mar 15	Feb 25 – Mar 15	Not recommended
Rye (winter)	Sept 10 – Sept 30	Sept 15 – Oct 20	Sept 25 – Oct 20	Oct 5 – 25
Warm season grasses	Mar 15 – May 15	Mar 15 – May 15	Mar 15 – Apr 30	Mar 01 – Apr 30
Cool season grasses ³	Aug 10 – Sept 10 (Mar 01 – Apr 01)	Aug 15 – Sept 15 (Feb 15 – Mar 15)	Aug 20 – Sept 20 (Feb 15 – Mar 15)	Aug 25 – Oct 01 (Feb 15 – Mar 15)
Triticale (winter)	Aug 20 – Sept 15	Aug 20 – Sept 25	Sept 01 – Sept 25	Sept 01 – Oct 01
Oats (winter)	Not recommended	Not recommended	Not recommended	Sept 20 – Oct 10

¹ Irrigated soybean.

² Comparative relative maturity.

³ Fall planting dates are preferred; however, spring planting dates are also acceptable.

Other cover crop options: cover crop selection tool: <https://covercroptool.midwestcovercrops.org/>

Planting Populations

Moving from west to east across the state, optimal plant populations for the various crops tend to increase; however, planting rates should be selected based on the productivity level of a given field and the percentage of pure live seed (PLS) of the seed lot to be used. (PLS is calculated as the % purity × % germination.) For this reason, planting rates are provided for low-yielding environments, middle-yielding environments, high-yielding environments, and irrigated environments (Table 2).

According to the climatic gradient in Kansas, the definition of these environments is primarily based on regional

rainfall patterns. Late planting dates may influence the target planting rates in crops such as wheat and grain sorghum. Late planting dates reduce tillering in these species. Larger-seeded crops are listed in target plants per acre (assuming seeding with a planter), while smaller-seeded crops are listed in target pounds of pure live seed per acre (assuming seeding with a drill). A conversion of pounds per acre to seeds per acre is listed in Table 7 based on typical seed size (seeds per pound). In addition, the approximate seeds per pound, standard bushel weights, and standard moisture of select crops are available in Table 8, although exact seeds per pound should be listed on a seed tag.

Table 2. Target per-acre plant populations by yield environment and planting date

	Low	Middle	High	Irrigated
Plant populations (plants per acre)				
Corn (grain)	14,000 to 20,000	20,000 to 24,000	24,000 to 28,000	28,000 to 36,000
Wheat (winter)*	750,000 to 900,000	900,000 to 1,125,000	1,125,000 to 1,350,000	1,125,000 to 1,350,000
Soybean	90,000 to 140,000	80,000 to 120,000	80,000 to 120,000	80,000 to 120,000
Sorghum (grain)*	25,000 to 45,000	35,000 to 55,000	50,000 to 90,000	80,000 to 110,000
Cotton	25,000 to 30,000	30,000 to 35,000	35,000 to 40,000	35,000 to 55,000
Sunflower (confectionary)	12,000 to 15,000	12,000 to 15,000	12,000 to 15,000	15,000 to 18,000
Sunflower (oilseed)	15,000 to 20,000	17,000 to 22,000	20,000 to 24,000	22,000 to 26,000
Canola (winter)	Open-pollinated: 230,000 to 460,000; Hybrid: 180,000 to 360,000			
Corn (silage)	16,000 to 22,000	22,000 to 26,000	26,000 to 30,000	30,000 to 36,000

Seeding rates (pounds pure live seed per acre, assuming ~70% emergence)

Alfalfa	8 to 12	12 to 15	12 to 15	15 to 20
Sorghum (silage)	10 to 15	12 to 20	20 to 30	30
Barley (spring)	60 to 96	60 to 96	72 to 96	75 to 96
Barley (winter)	40 to 50	60 to 96	72 to 96	75 to 96
Rye (winter)	55 to 60	55 to 60	55 to 60	55 to 60
Triticale (winter)	75 to 90	75 to 120	90 to 120	90 to 120
Oat (spring)	48 to 64	48 to 64	64 to 96	64 to 96
Millet (pearl)	5 to 15	10 to 20	10 to 20	10 to 20
Millet (foxtail)	15 to 30 (lower rates in dry environments, higher rates with more rainfall or irrigation)			

Selected additional grasses and legumes (pounds per acre)

2	4 to 6	8 to 10	10 to 15	15 to 20
Sand lovegrass	Switchgrass Native mixtures	Big bluestem Indiangrass Sideoats grama Western wheatgrass Red clover	Tall wheatgrass Smooth brome Sweetclover	Tall fescue Lespedeza (20 to 30 lbs)

Note: values should be adjusted based on germination rates and expected emergence (these are target values).

*late planting dates require increased populations due to decreased tillering.

Plant and Seed Spacing

Producers can estimate and check seeding rates and final plant populations in two ways – either by counting the number of seeds/plants in a given length of row (Tables 3 and 4) or by determining the average distance between seeds/plants in the row (Tables 5 and 6).

When determining the population per acre for larger-seeded species, averaged field measurements and row spacing are the only information required.

Estimated seeds per foot of row:

$$\frac{\text{seeds per acre}}{43,560} \times \text{row spacing (in feet)}$$

Estimated seeds per 10 feet of row:

$$\frac{\text{seeds per acre}}{43,560} \times \text{row spacing (in feet)} \times 10$$

Estimated inches between seeds in-row:

$$\frac{43,560 \times 12}{\text{seeds per acre} \times \text{row spacing (in feet)}}$$

A shortcut to determine plant population or seeding rate can be done by counting the number of plants or seeds in a row length equal to 1/1,000 of an acre, then multiplying that number by 1,000. For example, at 30-inch (2.5-foot) row spacing, 1/1,000 of an acre is equal to 17.4 feet of row. If an average of 24 plants is counted in 17.4 feet of row, the estimated plant population would be 24,000 plants per acre ($24 \times 1,000$). Common row spacings with a 1/1,000-acre equivalent row lengths are listed below:

Row Spacing	Row Length for 1/1,000 acre	Row Length for 1/1,000 acre
60-inch	8.7 feet	8 feet 8½ inches
30-inch	17.4 feet	17 feet 4¾ inches
20-inch	26.1 feet	26 feet 1¼ inches
15-inch	34.8 feet	34 feet 9⅞ inches
10-inch	52.2 feet	52 feet 3¼ inches
7.5-inch	69.7 feet	69 feet 8½ inches

Feet of row per 1/1,000 of an acre:

$$\frac{43,560}{\text{row spacing (in feet)} \times 1,000}$$

Table 3. Seeds per length of row by seeded population and row spacing

		Row spacing (inches)*						
		7.5	15	20	30	45	60	
Seeded population (seeds per acre)	1,250,000	17.9	35.87	47.83	—**	—	—	seeds per foot of row
	1,000,000	14.3	28.7	38.3	57.4	—	—	
	750,000	10.8	21.5	28.7	43.0	64.6	—	
	500,000	7.2	14.3	19.1	28.7	43.0	57.4	
	250,000	3.6	7.2	9.6	14.3	21.5	28.7	
	200,000	2.9	5.7	7.7	11.5	17.2	23.0	
	150,000	2.2	4.3	5.7	8.6	12.9	17.2	
	100,000	1.4	2.9	3.8	5.7	8.6	11.5	
	90,000	—	25.8	34.4	51.7	77.5	103.3	seeds per 10 feet of row
	80,000	—	23.0	30.6	45.9	68.9	91.8	
	70,000	—	20.1	26.8	40.2	60.3	80.3	
	60,000	—	17.2	23.0	34.4	51.7	68.9	
	50,000	—	14.3	19.1	28.7	43.0	57.4	
	40,000	—	11.5	15.3	23.0	34.4	45.9	
	30,000	—	8.6	11.5	17.2	25.8	34.4	
	25,000	—	—	9.6	14.3	21.5	28.7	
	20,000	—	—	7.7	11.5	17.2	23.0	
	15,000	—	—	5.7	8.6	12.9	17.2	
	10,000	—	—	—	5.7	8.6	11.5	

* Note: values should be adjusted based on germination rates and expected emergence for plant spacing.

** Dashes (—) represent values not normally encountered in Kansas cropping conditions.

When determining the population per acre for smaller-seeded species, averaged field measurements and the approximate number of seeds per pound are needed.

Before plants emerge, estimating the number of seeds per foot of row or distance between seeds provides a quick way to check drill or planter calibration in the field without digging up a significant length of row. Choosing a higher plant population results in a greater number of seeds per foot of row and less distance between seeds in the row.

Estimated seeds per foot of row:

$$\frac{\text{pounds PLS per acre}}{43,560 \times 12} \times \text{row spacing (in inches)} \times \text{seeds per pound}$$

Estimated inches between seeds in-row:

$$\frac{43,560 \times 144}{\text{pounds PLS per acre} \times \text{seeds per pound} \times \text{row spacing (in inches)}}$$

Table 4. Seeds per foot of row by seeded rate and seed size at 7.5-inch row spacing

		Seeded rate at 7.5-inch row spacing (pounds per acre)*								
		5	10	20	30	40	50	60	70	80
Seed size (seeds per pound)	300,000	21.5	43.0	86.1	—**	—	—	—	—	—
	250,000	17.9	35.9	71.7	—	—	—	—	—	—
	200,000	14.3	28.7	57.4	86.1	—	—	—	—	—
	150,000	10.8	21.5	43.0	64.6	86.1	—	—	—	—
	100,000	7.2	14.3	28.7	43.0	57.4	71.7	86.1	—	—
	90,000	6.5	12.9	25.8	38.7	51.7	64.6	77.5	90.4	—
	80,000	5.7	11.5	23.0	34.4	45.9	57.4	68.9	80.3	91.8
	70,000	5.0	10.0	20.1	30.1	40.2	50.2	60.3	70.3	80.3
	60,000	4.3	8.6	17.2	25.8	34.4	43.0	51.7	60.3	68.9
	50,000	3.6	7.2	14.3	21.5	28.7	35.9	43.0	50.2	57.4
	40,000	2.9	5.7	11.5	17.2	23.0	28.7	34.4	40.2	45.9
	30,000	2.2	4.3	8.6	12.9	17.2	21.5	25.8	30.1	34.4
	25,000	1.8	3.6	7.2	10.8	14.3	17.9	21.5	25.1	28.7
	20,000	—	2.9	5.7	8.6	11.5	14.3	17.2	20.1	23.0
	15,000	—	2.2	4.3	6.5	8.6	10.8	12.9	15.1	17.2
	10,000	—	—	2.9	4.3	5.7	7.2	8.6	10.0	11.5

* Note: values should be adjusted based on germination rates and expected emergence for plant spacing. For 15 inch, multiply by 2; for 20 inch, multiply by 2.7; etc.

** Dashes (—) represent values not normally encountered in Kansas cropping conditions.

Table 5. Inches between seeds in-row based on seeded population and row spacing

		Row spacing (inches)*					
		7.5	15	20	30	45	60
Seeded population (seeds per acre)	1,250,000	0.7	0.33	0.25	—**	—	—
	1,000,000	0.8	0.4	0.3	0.2	—	—
	750,000	1.1	0.6	0.4	0.3	0.2	—
	500,000	1.7	0.8	0.6	0.4	0.3	0.2
	250,000	3.3	1.7	1.3	0.8	0.6	0.4
	200,000	4.2	2.1	1.6	1.0	0.7	0.5
	150,000	5.6	2.8	2.1	1.4	0.9	0.7
	100,000	—	4.2	3.1	2.1	1.4	1.0
	90,000	—	4.6	3.5	2.3	1.5	1.2
	80,000	—	5.2	3.9	2.6	1.7	1.3
	70,000	—	6.0	4.5	3.0	2.0	1.5
	60,000	—	7.0	5.2	3.5	2.3	1.7
	50,000	—	8.4	6.3	4.2	2.8	2.1
	40,000	—	10.5	7.8	5.2	3.5	2.6
	30,000	—	13.9	10.5	7.0	4.6	3.5
	25,000	—	—	12.5	8.4	5.6	4.2
	20,000	—	—	15.7	10.5	7.0	5.2
	15,000	—	—	20.9	13.9	9.3	7.0
	10,000	—	—	—	20.9	13.9	10.5

* Note: values should be adjusted based on germination rates and expected emergence for plant spacing.

** Dashes (—) represent values not normally encountered in Kansas cropping conditions.

Table 6. Inches between seeds in-row by seeded rate and seed size at 7.5-inch row spacing

		Seeded rate at 7.5-inch row spacing (pounds per acre)*								
		5	10	20	30	40	50	60	70	80
Seeds per pound (seed size)	300,000	0.6	0.3	0.14	—**	—	—	—	—	—
	250,000	0.7	0.3	0.2	—	—	—	—	—	—
	200,000	0.8	0.4	0.2	0.14	—	—	—	—	—
	150,000	1.1	0.6	0.3	0.2	0.14	—	—	—	—
	100,000	1.7	0.8	0.4	0.3	0.21	0.17	0.14	—	—
	90,000	1.9	0.9	0.5	0.3	0.23	0.19	0.15	0.13	—
	80,000	2.1	1.0	0.5	0.3	0.3	0.21	0.17	0.15	0.13
	70,000	2.4	1.2	0.6	0.4	0.3	0.24	0.20	0.17	0.15
	60,000	2.8	1.4	0.7	0.5	0.35	0.28	0.23	0.20	0.17
	50,000	3.3	1.7	0.8	0.6	0.4	0.33	0.28	0.24	0.21
	40,000	4.2	2.1	1.0	0.7	0.5	0.4	0.35	0.30	0.26
	30,000	5.6	2.8	1.4	0.9	0.7	0.6	0.5	0.4	0.3
	25,000	6.7	3.3	1.7	1.1	0.8	0.7	0.6	0.5	0.4
	20,000	—	4.2	2.1	1.4	1.0	0.8	0.7	0.6	0.5
	15,000	—	5.6	2.8	1.9	1.4	1.1	0.9	0.8	0.7
	10,000	—	—	4.2	2.8	2.1	1.7	1.4	1.2	1.0

* Note: values should be adjusted based on germination rates and expected emergence for plant spacing. For 15 inch, divide by 2; for 20 inch, divide by 2.7; etc.

** Dashes (—) represent values not normally encountered in Kansas cropping conditions.

Table 7. Seeded population per acre based on pounds seeded per acre and seed size

		Seeded rate (pounds per acre)								
		5	10	20	30	40	50	60	70	80
Seed size (seeds per pound)	300,000	1,500,000	3,000,000	6,000,000	9,000,000	12,000,000	15,000,000	18,000,000	21,000,000	24,000,000
	250,000	1,250,000	2,500,000	5,000,000	7,500,000	10,000,000	12,500,000	15,000,000	17,500,000	20,000,000
	200,000	1,000,000	2,000,000	4,000,000	6,000,000	8,000,000	10,000,000	12,000,000	14,000,000	16,000,000
	150,000	750,000	1,500,000	3,000,000	4,500,000	6,000,000	7,500,000	9,000,000	10,500,000	12,000,000
	100,000	500,000	1,000,000	2,000,000	3,000,000	4,000,000	5,000,000	6,000,000	7,000,000	8,000,000
	90,000	450,000	900,000	1,800,000	2,700,000	3,600,000	4,500,000	5,400,000	6,300,000	7,200,000
	80,000	400,000	800,000	1,600,000	2,400,000	3,200,000	4,000,000	4,800,000	5,600,000	6,400,000
	70,000	350,000	700,000	1,400,000	2,100,000	2,800,000	3,500,000	4,200,000	4,900,000	5,600,000
	60,000	300,000	600,000	1,200,000	1,800,000	2,400,000	3,000,000	3,600,000	4,200,000	4,800,000
	50,000	250,000	500,000	1,000,000	1,500,000	2,000,000	2,500,000	3,000,000	3,500,000	4,000,000
	40,000	200,000	400,000	800,000	1,200,000	1,600,000	2,000,000	2,400,000	2,800,000	3,200,000
	30,000	150,000	300,000	600,000	900,000	1,200,000	1,500,000	1,800,000	2,100,000	2,400,000
	25,000	125,000	250,000	500,000	750,000	1,000,000	1,250,000	1,500,000	1,750,000	2,000,000
	20,000	100,000	200,000	400,000	600,000	800,000	1,000,000	1,200,000	1,400,000	1,600,000
	15,000	75,000	150,000	300,000	450,000	600,000	750,000	900,000	1,050,000	1,200,000
	10,000	50,000	100,000	200,000	300,000	400,000	500,000	600,000	700,000	800,000

* Note: rates should be adjusted based on germination rates and expected emergence. Values above assume 100% of each.

Table 8. Approximate seeds per pound, standard bushel weights, and standard moisture of select crops

Species	Seeds per pound	Standard bushel (lb)	Standard moisture
Corn	1,200 to 1,800	56	15.5%
Barley	12,000 to 15,000	48	14.5%
Grain sorghum	14,000 to 16,000	56	14%
Wheat	11,000 to 20,000	60	13.5%
Oat	12,000 to 17,000	32	13.5%
Soybean	2,800 to 3,200	60	13%
Sunflower (confectionary)	2,000 to 5,000	25	10%
Sunflower (oilseed)	5,000 to 9,000	30	10%
Canola	75,000 to 125,000	50	8.5%
Rye	18,000	56	
Triticale	13,000	50	
Cotton	4,000 to 5,000	32 (cotton seed)	
Alfalfa	190,000 to 230,000	60	
Pearl millet	60,000 to 70,000	60	
Foxtail millet	200,000 to 230,000	50	
Smooth brome grass	140,000	14	
Tall fescue	230,000	32	
Red clover	275,000	60	
Sweetclover	250,000	60	
Lespedeza (Korean)	220,000 to 240,000	40 (unhulled)	
Sand lovegrass	1.3 to 1.5 million		
Switchgrass	380,000 to 400,000		
Big bluestem	165,000 to 190,000		
Indiangrass	175,000		
Sideoats grama	190,000		
Western wheatgrass	90,000		
Tall wheatgrass	75,000		

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