

Seeding Practices for Michigan Crops

L. O. Copeland, O. B. Hesterman, F. J. Pierce and M. B. Tesar
Extension Specialists, Department of Crop and Soil Sciences

Seed is one of the most important inputs you purchase for any crop production system. By choosing the proper variety, by using high quality seed and by planting your crops at the proper time, rate and depth, you can have a major impact on the productivity and profitability of your crop enterprise. This bulletin describes seed quality characteristics and presents information you can use when deciding on seeding practices for Michigan crops. Information on selecting varieties and overall crop management can be found in greater detail in other Cooperative Extension Service publications. Contact your local county Extension Service office for additional information.

Seed Quality

High quality seed is important to obtain the desired plant population, high yield and high quality in the harvested crop. High quality seed means high germination (usually above 90 percent); absence of noxious weed seeds; and relative freedom from other crop seeds, diseased seeds, weed seeds and inert matter. In addition, seed should be of uniform size for accurate planting, especially with standard planter plates. CERTIFIED SEED is the most reliable source of high quality seed.

Planting information presented here is based on the use of high quality seed. Never plant seed of unknown variety or doubtful quality. If you must plant substandard seed in emergency situations, increase your seeding

rate by the difference between the actual germination and 85-90 percent represented by acceptable quality seed.

Plant Population

An optimum plant population is essential for high yields and net return. A very high population can result in excessive plant competition for water and nutrients, sterility in corn, lodging in soybeans and excessive seed cost. A below-optimum population can result in inefficient use of water, nutrients and light, and thus lower yields and lower net return.

Plant population or seeding rate is influenced by row width, crop species, soil and climatic variables, and crop use. (See Tables 1-6 to determine optimum planting rates for various crops grown in Michigan.)

Seeding Rates for Row Crops

Seeding rates for field crops are generally expressed in pounds or bushels per acre. Because of the large number of varieties and hybrids available and the great variation in seed size, other methods of expressing seeding rates are usually more appropriate. Seeds per foot of row is a better designation for soybeans (see Table 1) and field beans (see Table 2). "Inches between seeds" (Table 3) can be used to determine proper plant populations for hybrid corn.

Using these designations allows the same seeding rate to be used for each variety, regardless of seed size or grade. To calculate total seed requirements, you must know the number of seeds per pound.

Seeding Rates for Solid Seeded Crops

Seeding rates for forages and small grains (Table 6) are given in pounds or bushels per acre. The ranges listed account for variable planting conditions and seed size. There are fewer large-sized seeds than small-sized seeds in a bushel or pound. Therefore, it takes a greater weight or volume of large-seeded varieties per acre than of small-seeded varieties to achieve similar populations.

If climatic, soil and fertility conditions are optimal and you are using high quality seed (high germination and purity), you can use the lower seeding rates listed in Table 6. Less than optimal conditions often require the higher rates.

Table 1. Suggested planting rates for soybeans in rows.*

Row width (in.)	Seeds/ft. of row**	Approx. lbs/acre***
28-30	7-9	45-60
18-20	6-8	50-70
14-16	4-5	60-80
7-10	2.5-4	70-100

*Based on 90% germination; allows for one rotary hoeing and good standability.

**Use the higher number of the range for the wider row width.

***Pounds per acre will vary with the variety because of differences in seed size. Use low rates for small-seeded varieties, high rates for large-seeded varieties.

Seeding methods also affect seeding rate. Band seedings with fertilization and use of press wheels give best results when establishing forages. When planting a grass with a legume, you can vary the seeding rate of the grass to obtain more or less grass in the stand.

Small grains intended for use as silage or green chop should be seeded at 1.5 times the recommended rates for grain. If you are using small grains as companion (nurse) crops with forages, reduce the recommended seeding rate for the small grains by one-fourth to one-third.

Planter Considerations

Depending on your tillage system, your planter or grain drill should be equipped with the proper combination of weight (down pressure), coulters, furrow openers, closing devices, pesticide applicators (for insecticide and/or herbicides) and fertilizer applicators. Replace all worn parts and align all planting units and accessories properly. Then calibrate the planting unit for the desired seeding rate and seeding depth. Seeding rate will vary, depending on the size and shape of the seed planted. Do not rely on the charts provided with the planter or drill—they serve only as a guide.

A drill can be calibrated by the following method:

1. Open seed tubes from four units of the drill and attach plastic bags or tubes to catch the seed. Each drill unit will vary, so sampling from a number of them and averaging will give a better estimate of the seeding rate than sampling from a single unit.
2. Set the gear drives and settings to those recommended by the manufacturer for the crop to be planted. Be sure the correct seed cups are in place for the desired crop.

Table 2. Suggested planting rates for field beans.

	Commercial Dry Bean Classes			
	Navy and Black Turtle	Kidney and Cranberry	Pinto and Great Northern	Yelloweye and Marrow
Row Width 28-30"				
Seeds/ft. of row	4 to 5	3 to 4	3 to 4	3 to 4
App. lb/acre	40-45	70-75	50-55	60-65
Row Width 20-22"				
Seeds/ft. of row	4 to 5	2 to 3	2 to 3	2 to 3
App. lb/acre	45-50	75-80	55-60	65-70
Row Width 14-16"				
Seeds/ft. of row	3 to 4	2 to 3	2 to 3	2 to 3
App. lb/acre	50-55	80-90	70-80	80-90
Row Width 7-10"				
Seeds/ft. of row	2 to 3	1 to 2	2 to 3	2 to 3
App. lb/acre	60-65	100-120	90-100	90-100

Only upright varieties of dry beans are recommended for production in row widths narrower than 20 inches.

Table 3. Approximate number of seeds per acre at varying row widths and spacings in the row.

Seed spacing in the row (in.)	Row width (in.)									
	7	14	20	24	28	30	32	36	38	40
1	896,000	448,000	314,000	261,000	224,000	209,000	196,000	174,000	165,000	157,000
1.5	598,000	299,000	209,000	174,000	149,000	139,000	131,000	116,100	110,000	104,000
2	448,000	224,000	155,000	131,000	112,000	104,000	98,000	87,100	82,500	78,400
3	298,000	149,300	104,000	87,100	74,800	69,700	65,400	58,000	55,000	52,300
4	224,000	112,000	78,400	65,300	56,000	52,200	49,000	43,500	41,300	39,200
5	179,000	89,600	62,700	52,300	44,900	41,800	39,200	34,800	33,000	31,400
6	149,000	74,700	52,400	43,600	37,300	34,800	32,700	29,000	27,500	26,100
7	217,000	63,500	44,400	37,000	31,700	29,600	27,800	24,700	23,400	22,200
8	112,000	56,000	39,100	32,700	28,000	26,100	24,500	21,800	20,600	19,600
9	99,300	49,700	34,800	29,000	24,800	23,100	21,700	19,300	18,300	17,400
10	89,600	44,800	31,400	26,100	22,400	20,900	19,600	17,400	16,500	15,700
11	81,400	40,700	28,500	23,700	20,400	19,000	17,800	15,800	15,000	14,300
12	74,700	37,300	26,100	21,800	18,700	17,400	16,300	14,500	13,800	13,100

3. Drive the planter or drill a known distance (e.g., 100 feet).

4. Measure the weight of the collected seed. Use the following equation to calculate the seeding rate.

$$\text{Seeding rate (lb/acre)} = \frac{\text{lb seed collected} \times 43,560 \text{ (ft}^2\text{/A)}}{[\text{row spacing (in)}/12 \times \text{distance traveled (ft)} \times \text{No. planter units sampled}]}$$

$$\text{Seeding rate (bu/acre)} = \frac{\text{seeding rate (lb/acre)}}{\text{weight per bushel}}$$

$$\text{Seeding rate (seeds/ft row)} = \frac{\text{lb seed collected} \times \text{seeds per pound}}{\text{planter units sampled} \times \text{distance traveled (ft)}}$$

5. Record the drill settings and the seeding rates calculated from the sample. If the seeding rate was lower than desired, move to the next higher seeding rate setting suggested by the manufacturer. If the seeding rate calibration falls between two settings on the drill, use the higher setting to avoid underseeding and be sure to record the settings.

The planter or drill should also be adjusted for seeding depth. Penetration into the soil will be quite different under no-till conditions than for a tilled field. It will also vary by soil type and soil moisture. Each drill varies in how depth settings are determined. Through trial and error, determine settings for proper seed placement for residue, tillage and soil moisture conditions in your field.

Table 4. Suggested corn plant populations.*

Yield goal (bu./acre)	Plants/acre
70-80	14,000-16,000
90-120	18,000-19,000
130-200	20,000-23,000

(In southern Michigan, if corn is planted by May 1, use a seed population 15 to 20 percent higher than the desired population. For May 1-20 planting, use 10-15 percent more seed than desired plants. After May 20, use 10 percent more seed.)

*May desire higher rates under irrigation.

Table 5. Approximate numbers of seed per unit in good quality bean seed.

Type	Seeds/lb.	Seeds/cwt or bu.
Navy bean	2,200	220,000/cwt
Cranberry bean	900	90,000/cwt
Red kidney bean	800	80,000/cwt
Black turtle bean	2,200	200,000/cwt
Pinto bean	1,200	120,000/cwt
Yelloweye bean	950	95,000/cwt
Soybean, small seed	3,000	180,000/bu
Soybean, medium-sized seed	2,600	156,000/bu
Soybean, large seed	2,200	132,000/bu

Calculating Seed Requirements for Desired Stands

Row crops, especially corn, are typically overplanted to compensate for seed and seedling mortality. Under average conditions of moisture and temperature, 10 to 15 percent seed and seedling mortality may be expected even with high quality seed. On organic soils, or with very early planting on mineral soils, seedling losses may reach or exceed 20 percent. These principles can also be applied to other row crops.

For hybrid corn, a grower may want a final population of 20,000 plants per acre in 30-inch rows. Allowing about 15 percent extra seed to account for seed and seedling mortality makes the seed requirement 23,000 seeds per acre (1.15 times 20,000). In Table 1, under the 30-inch row spacing, the closest number of kernels to 23,000 is 23,100. This occurs when seed is spaced 9 inches apart in 30-inch rows. One bag with 80,000 kernels will plant 3.5 acres.

Another method of calculating seed requirements, without the use of Table 1, is as

follows: Assume you wish to plant 50 acres of a large-seeded soybean variety in 30-inch rows at the rate of 10 seeds per foot of row.

Imagine, then, that you have a "long acre," that is, one row 30 inches wide. Such a row would need to be 17,424 feet long (43,560 sq. ft. per acre divided by 2.5 ft.). With 10 beans per foot in this "long row," you would need 174,240 seeds per acre. According to Table 5, the number of seeds per pound of a large-seeded variety is 2,200. For 50 acres, multiply 174,240 times 50 and divide by 2,200. Seed required = 3,960 pounds or 66 bushels.

Planting Speed May Affect Plant Stand

Seed spacing in row crops is affected by planting speed. For many corn planters, a speed of 3 to 4 miles per hour is optimum. At higher speeds, spacing of seeds is less uniform and there is a tendency for skipping and bunching. Newer planters are more accurate at higher speeds. Use of planter plates with more cells per plate will improve planting accuracy at higher speeds. Plateless planters may also allow higher speed without sacrificing planting accuracy. Under any condition, check spacing and number of seeds per acre or foot of row, as well as planting depth and fertilizer placement.

Planting speed does not affect the rate of small-seeded legumes or grasses in modern drills with fluted seed delivery units, which deliver accurately measured seed amounts regardless of speed of travel.

Planting Depth

Recommended planting depths for various crops are listed in Table 6. Planting depth is affected by seed size, soil texture, moisture and temperature. Crops planted in dry, coarse-textured (sandy) soils may require deeper planting. Soils that are cold, fine textured (clay) and/or wet may require shallower planting. Seeds of forage crops are typically very small and can emerge only from a shallow depth, generally less than ½ inch. Therefore, take extreme care with planting depth. Cultipacker seeders and band seeders followed by press wheels or a cultipacker help ensure shallow seed placement. Check sod seeder drills carefully for seed depth.

Planting Date

Dates of planting for various crops are given in Table 6. Planting dates vary each year because of weather differences. Farther north, the calendar date of planting is normally later with spring-seeded crops and earlier with fall-seeded crops. Proximity to the Great Lakes also affects temperatures and planting dates.

Table 6. Weight per bushel, seeds per pound and recommended seeding rate, depth and planting date for Michigan crops.

Crop	Weight per bu. (lb)	No. seeds per lb	Seeding rate per acre (lb)	Planting depth (in)	Planting dates	Remarks
FORAGE LEGUMES FOR FORAGE, PASTURE, GREENCHOP, GREEN MANURE AND COVER CROP						
Alfalfa	60	220,000	12-16 alone or with a grass	¼-½	With oats or barley in Apr.-May. Clear seeded in Apr.-mid-Aug. Do not seed after early Aug. in N. Mich.	Seeding alone with herbicides (clear seeding) in spring preferred. Also does well on well drained mucks with bromegrass.
Red clover	60	260,000	8-12 alone or with 2-4 lb timothy	¼-½	With oats or barley or alone in spring.	Two cuts for hay use.
Mammoth clover	60	260,000	8-12 alone	¼-½	Feb.-mid-Apr.	Broadcast seeded in winter wheat for green manure plowdown.
Birdsfoot trefoil	60	370,000	5-6 alone or with grass or with 4-8 lb red clover in U.P.	¼-½	Preferably in Apr.-May with herbicides (clear seeded). Can be seeded with oats or barley in spring or alone by Aug. 1 in S. Mich., July 25 in N. Mich.	Use double amount of slurry inoculant. Must remove small grain early as silage, hay or pasture.
Ladino clover	60	860,000	1-2 alone or with grass	¼-½	With oats or barley in spring or Aug. 1-15.	Use ¼ lb per acre of seed in alfalfa-brome mixtures.
Sweet clover	60	250,000	12-15 alone	¼-½	With oats or barley in spring.	Used primarily as a green manure crop.
Alsike clover	60	680,000	3-5 in grass mixture	¼-½	With oats or barley in spring.	Use in lowland pasture mixtures.
Crownvetch	60	140,000	8-12 alone	¼-½	Clear seed Apr.-June 1 alone with herbicides.	Use double amount of slurry inoculant. Scarify seed. No companion crop.
PERENNIAL GRASSES FOR FORAGE, PASTURE, GREENCHOP, COVER CROP AND TURF						
Smooth bromegrass	14	135,000	3-5 in legume-grass mixture or 12-15 alone	½-1	Spring-Aug. 15 or Nov. 1-20 alone on muck soil	Normally seeded with alfalfa or on mucks dry enough for corn.
Orchardgrass	14	590,000	12-15 alone or maximum of 2 in legume-grass mixture	¼-½	Spring-Aug. 15 or Nov. 1-20 alone on muck soil.	Normally seeded with alfalfa or on mucks drier than for reed canarygrass. Use late maturing varieties.
Timothy	45	1,230,000	2-4 in legume-grass mixture or 8 alone.	¼-½	Spring or Aug. 1-15	Normally seeded with alfalfa, red clover, birdsfoot trefoil.
Reed canary grass	44-48	550,000	6 alone	¼-½	Spring-Sept. 15 or Nov. 1-20	On wet soils; especially on very wet muck soils.
Kentucky bluegrass	14-28	2,200,000	15-25 or 5-10 for pasture	¼-½	Early spring or Aug. 15-Sept. 15 or Nov. 1-20.	August planting preferred. For turf, use 1 lb/1,000 ft².
Fescue, tall	24	225,000	15 alone	¼-½	Spring-Sept. 15 or Nov. 1-20.	Exercise pasture. For coarse turf, playgrounds, etc., 2-4 lb/1,000 ft².
Fescue, red or creeping	15-40	545,000	15-30 alone	¼-½	Spring-Sept. 15 or Nov. 1-20.	Will tolerate shaded conditions. Use for spring cover crop or turf. For turf, use 1-2 lb/1,000 ft².
Redtop	14	5,000,000	2-3 in grass mixture	¼-½	Spring-Sept. 15 or Nov. 1-20.	Normally not used. Adapted to moist soils in grass mixtures.

(table continued)

Table 6 (continued).

Crop	Weight per bu. (lb)	No. seeds per lb	Seeding rate per acre (lb)	Planting depth (in)	Planting dates	Remarks
ANNUAL GRASSES FOR FORAGE, PASTURE, GREENCHOP, COVER CROP AND TURF						
Sorghum sudangrass hybrid	—	15,000-20,000	30 broadcast	1-2	May 1-June 15 in S. Mich.; June 1-15 in N. Mich.	Greenchop or pasture.
Sudangrass	40	55,000	20-30 broadcast	1-2	May 1-June 15 in S. Mich.; June 1-15 in N. Mich.	Summer pasture or hay.
Sorghum (forage)	50	15,000-20,000	6-10 in 20- to 40-inch rows	1-2	May 1-25 in S. Mich.; June 1-15 in N. Mich.	Plant in rows similar to corn. Cut once for silage.
Rape, cabbage-turnip crosses	50	157,000	4-6 broadcast	1	April-early Aug.	Sheep pasture after herbicide-suppressed grass sod or after small grain. May need herbicide after small grain.
Millet, common, pearl, hog, Japanese	50	220,000	20-30 broadcast	½-1	May 1-June 20	Use for greenchop, hay or silage.
Ryegrass, domestic	24	250,000	10 broadcast	½	At last cultivation of corn. Aug. 15-Sept. 15 for turf.	As cover crop; improved types available for lawns. 2-5 lb/1,000 ft². Use for pasture, silage or hay.
Oats and peas			2-3 bu, mix in equal amounts	1-2	April	For silage or hay.
Domestic ryegrass and sweet clover			10—ryegrass 10—sw. clover	½	Last cultivation of corn.	Cover crop.
Oats, barley, triticale: <i>refer to cash and feed crops section.</i>						
CASH AND FEED CROPS						
Canola (spring)	60	142,400	5-6	½	Soon as possible in spring-May 1.	
Canola (winter)	60	156,960	5-6	½	Aug. 25-Sept. 5.	
Corn (field)	56	1,300-2,200	10-16 (18,400-26,400 kernels)	1½-2½	April 20-May 25.	Seeding rate depends on seed grade, soil productivity and time of planting. Increase seeding rate under irrigation.
Corn (pop)	56	3,000-4,000	3-5	1-2	May 5-June 1.	Seeds per lb depends on type.
Soybeans	60	2,000-3,000	See Table 1	1½-2	May 1-July 1.	Earlier planting recommended. Narrow rows have been shown to produce higher yields.
Field beans (navy)	60	2,200-2,400	40-65	2	May 25-June 15, preferably June 1-5.	See Table 2 for detailed seeding rates.
Field beans (black turtle soup)	60	2,200	40-65	2	June 1-15.	See Table 2 for detailed seeding rates.
Field beans (pinto)	60	1,200	50-100	2	June 1-15.	See Table 2 for detailed seeding rates.
Field beans (kidney)	60	800-900	70-120	2	June 1-15.	See Table 2 for detailed seeding rates.
Field beans (cranberry and yelloweye)	60	850-1,000	60-100	2	June 1-15.	See Table 2 for detailed seeding rates.
Wheat (spring)	60	12,000	90	1-2	Soon as possible in spring.	Not suitable for milling purposes.

(table continued)

Table 6 (continued).

Crop	Weight per bu. (lb)	No. seeds per lb	Seeding rate per acre (lb)	Planting depth (in)	Planting dates	Remarks
CASH AND FEED CROPS Continued						
Wheat (winter)	60	12,000	90-150	1-2	Sept. 13-Oct. 20 in S. Mich.; Aug. 10-30 in N. Mich. and U.P.	Plant after fly-free date plus 10 days in lower Mich.
Sugar beets		31,000-57,000	1-1¼	¾-1¼	April 10-May 15.	Space seed 5-5¼ inches in rows.
Potatoes	60		17-20 cwt	3-4	May 1-June 1.	Use 1¾ oz seed piece. Space 8-10 inches apart (except Russet Burbank and Norchip, which should be 10-12 inches) in 34-inch rows.
Oats	32	13,000	64-80	1-2	Soon as possible in spring—by May 15 in S. Mich., by June 1 in N. Mich.	
Barley (spring)	48	13,000	96	1-2	Soon as possible in spring—by May 15 in S. Mich., by June 1 in N. Mich.	
Barley (winter)	48	13,000	96-120	1-2	Sept. 10-30.	
Rye	56	18,000	84-112	1-2	Sept. 1-Nov. 1	May be planted earlier for green manure or for winter cover in corn (in August).
Sorghum (grain)	56	15,000-20,000	4-6 (6-8 plants/ft in 30-inch rows)	1-2	May 15-June 10.	Plant in rows. Grow only south of Bay City-Muskegon line.
Sunflower	24-30	3,000-9,000	3-7 (16,500-23,000 seeds)	1-2	May 1-25.	
Buckwheat	48	20,000	45-60	1-2	June-early July.	For grain and summer green manure.
Millet (grain)	50	80,000	10-15	½-1	June 1-30.	Emergency crop.
Vetch	60	21,000	15-20	1-2	Sept. 1-Nov. 1.	Seed with rye.
Spelt	30-40		50-100	1-2	Sept. 10-Oct. 10.	
Triticales	45-50		50	1-2	Sept. 10-Oct. 15 or Apr. 1-30, if spring type.	



MSU is an Affirmative Action/Equal Opportunity Institution. Cooperative Extension Service programs are open to all without regard to race, color, national origin, sex, or handicap.

Issued in furtherance of Cooperative Extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. W.J. Moline, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by the Cooperative Extension Service or bias against those not mentioned. This bulletin becomes public property upon publication and may be reprinted verbatim as a separate or within another publication with credit to MSU. Reprinting cannot be used to endorse or advertise a commercial product or company.

Major Revision of E-489, destroy old—10M—2:88—KMP—SP, Price 40¢ File:22.7 Field Crops-General.

