

# HARVESTING, DRYING & STORING SOYBEANS

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## Harvesting

It has been estimated that an average operator will leave from 2 to 4.5 bushels of soybeans per acre in the field (5 to 10% loss). Considering the price of soybeans (~\$10/bu), reducing losses from 10% to 5% results in a savings of \$22.50 per acre. Measure harvest losses (4 seeds per square foot = 1 bu/ac loss) and strive to keep them below 3%.

Seed moisture at harvest:

The moisture of the bean and the hull determine the best time for harvesting soybeans. The range is from 9% to 20% moisture content (wet basis), but research at the University of Missouri has indicated that soybeans can be harvested at 15% moisture content and that there is less seed damage at higher moisture contents. Seed damage increases as the moisture content decreases, so harvest promptly if the moisture drops below 13.5%. UMO research indicated that there is considerably less visible damage to the soybean when it is harvested above 13.5% moisture and it should be harvested prior to reaching 11.5% to reduce seed damage. Rewetting after maturity results in a higher percentage of cracked seed coats when harvested.

Operating the Combine:

Adjustments in order of importance are ground speed, cutterbar height, reel position and speed, threshing, and cleaning.

- Ground speeds above 2½ - 4 mph can result in high losses at the header.
- Keep the cutterbar as low as possible for field conditions to reduce stubble loss.
- Set the reel axle 6 to 12 inches in front of the cutterbar. Run the reel about 1.25 faster than the ground speed to reduce shattering.
- Soybeans should be cut as close to the ground as possible.
- Cylinder speeds above 500 rpm result in higher seed crackage. Follow the operator's manual for the initial settings for the cylinder speed and concave/rotor spacing.

## Drying

Soybeans are usually dried with natural air (no heat), although a small amount of heat (5 to 10 degrees) can be added when the relative humidity is above 80% (see Table 1). Generally, a drying temperature below 110°F is recommended. Drying time is dictated by airflow rate, with a minimum of 1 cfm/bu recommended. The University of Minnesota Extension Service website (<http://webapps.bbe.umn.edu/fans/>) can be used to estimate the airflow rate for a given fan-bin combination. For example, a 10 hp axial fan can provide 1 cfm/bu in a 30-ft diameter bin of soybeans that is 20-ft deep (11,300 bu), or 3 cfm/bu at 8-ft of depth (4500 bu).

Table 1. Equilibrium moisture content for soybeans at various T and RH levels.

Temp.	Relative Humidity, %						
	40	50	60	65	70	80	85
F							
30	7.9	9.5	11.6	12.9	14.5	19.2	23.1
40	7.7	9.3	11.4	12.7	14.3	18.9	22.7
50	7.6	9.1	11.2	12.4	14.0	18.6	22.4
60	7.5	9.0	11.0	12.2	13.8	18.3	22.0
70	7.3	8.8	10.8	12.0	13.5	18.0	21.7
80	7.2	8.7	10.6	11.8	13.3	17.7	21.3

## Storing

### Moisture Content:

Soybeans should be dried to a level that matches the storage period. If sold before spring they should be dried to 13.0%, but if held through the summer they should be dried to 11.0% to keep the relative humidity of the air in the void space (between seeds) below 65%. Be careful not to over-dry soybeans (see Table 2). With today's price, drying a point below the market level (13.0%) amounts to 11.4 cents per point. For this reason, consider installing an automated fan control system that can be programed to operate the fan according to outside air conditions.

Table 2. Cost of drying soybeans below the market level of 13.0%.

Amount of water in soybeans				Market Value, \$/bu	\$ 10.00			
				Electricity, \$/kwh	\$ 0.10			
	lb/bu	Base MC	Water loss		Value	Energy		
Moisture	13.0%	Test Wt	below base		of Water	cost	Total	
Content	52.2	DM	#/bu	MC	c/bu	c/bu		
9.0	5.16		2.64	9.0	44.0	8.0	52.0	
10.0	5.80		2.00	10.0	33.3	6.0	39.3	
11.0	6.45		1.35	11.0	22.5	4.0	26.5	
12.0	7.12		0.68	12.0	11.4	2.0	13.4	
13.0	7.80		0	13.0	0.0	0.0	0.0	

### Clean Grain:

Ideally, weed seeds, stems, and other foreign material should be removed from soybeans before they are stored. Accumulation of trash in small pockets in the grain bin can cause heating and may lead to caking and spoilage. Normally, when cleaning soybeans, particles removed are larger than the seeds. Alternatively, core the bin daily when filling or after the bin is full to remove the pocket of trash that tends to accumulate in the center of the bin.

### Aeration:

Soybeans should be cooled after storage and about 10 degrees each month afterwards to about 35 degrees. Seal the fan(s) with a tarp or heavy plastic sheet after the last cooling cycle to reduce wind driven air movement through the grain.

Estimate the amount of time to run the fan for a complete cooling cycle by dividing 15 by the amount of airflow in cfm/bu. For example, only 15 hours of fan operation is needed at 1 cfm/bu, but 150 hours are needed at 0.1 cfm/bu, which is considered the minimum rate for aeration. The University of Minnesota Extension Service WINFANS program can also be used to estimate the airflow rate at different depths for a given fan-bin combination.

### Safety:

Know the dangers associated with flowing grain and exposure to grain dust and educate all workers on the farm of these hazards. See UK publication AEN-39 for more details (<http://www2.ca.uky.edu/agc/pubs/aen/aen39/aen39.pdf>). Never enter a grain bin while the unloading auger is operating because the moving grain can pull a person below the grain surface in less than five seconds. Always disconnect the electrical power for motors on unloading augers or remove the belt drive when entering a bin of grain and work in pairs with a person on the ground who can call for help if needed. Personal protective equipment for bin inspections includes a climbing harness and respirator at minimum.

**References:**

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