

## Additional Resources

**Post Harvest Handling of Crops**, Bill Wilcke, University of Minnesota Department of Bioproducts and Biosystems Engineering, [http://www.bbe.umn.edu/Post-Harvest\\_Handling\\_of\\_Crops.html](http://www.bbe.umn.edu/Post-Harvest_Handling_of_Crops.html)

Website includes links to:

- **Soybean Drying, Handling and Storage**, Bill Wilcke, Vance Morey and Ken Hellevang
- **Natural-air Corn Drying in the Upper Midwest**, Bill Wilcke and Vance Morey
- **FANS: Fan Selection for Grain Bins** (software)

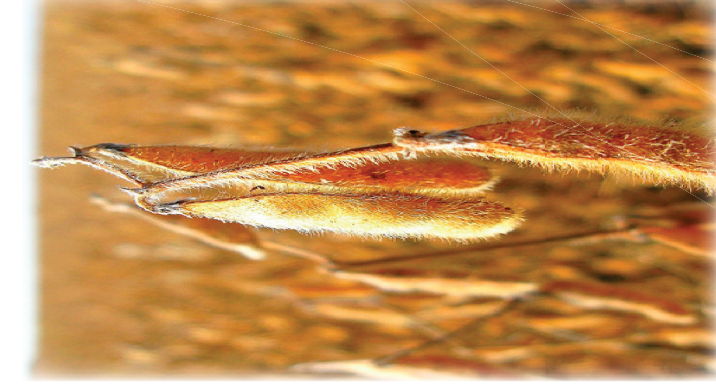
**Grain Drying, Handling and Storage**, Ken Hellevang, North Dakota State University Extension Service, <http://www.ag.ndsu.nodak.edu/abeng/postharvest.htm>

Website includes links to:

- **NDSU Offers Soybean Drying, Storage Advice**
- **Natural Air/ Low temperature Crop Drying**

**Late Harvest Resources**, University of Minnesota Extension. Website has information on soil compaction and crop quality and drying issues related to wet, late harvest conditions. <http://www.extension.umn.edu/lateharvest/>

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Dear Ag Producer,

With a challenging harvest in progress, this issue will focus on storage and drying issues of wet soybeans. The information comes from Liz Stahl and Bill Wilcke, both with University of Minnesota Extension and Ken Hellevang from North Dakota State University Extension Service.

You may notice a couple of changes with this issue. While the newsletter is shorter, I plan to issue it more frequently. My hope is to hit timely issues when they matter to you.

Harvest of our nitrogen management study sites is complete (only because they are hand harvested!). A big thank you goes to our 2009 cooperators, Paul Bauer and Randy Sorg! The results aren't available quite yet, but will be included in a winter issue of Focus on Ag. Stay tuned!

Wishing you a safe harvest,



Phyllis Bongard  
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2010 Winter Events

Private Pesticide Applicator Training  
- February 26 (tentative)  
Economics of Manure Workshops  
- To be announced  
Crops Day  
- early March  
Riparian Forest Buffers  
- To be announced

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• [www.dakotacounty.us](http://www.dakotacounty.us), then search *agriculture*

**What's inside?**

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## Economics of Manure Workshops

The increasing cost of fertilizers has, in turn, increased the value of nutrients in livestock manure. But how much is it actually worth? The Economics of Manure workshop is designed to help producers maximize returns when using manure as a fertilizer replacement and to determine its economic value for sale or purchase.

Producers will have an opportunity to determine these values for their own farms based on their own

information. Each workshop can accommodate 10 to 15 people, so please let me know if you would be interested in attending one. Workshops will be scheduled in January or February based on the amount of interest. There is no cost for attending and each participant will receive a copy of the Extension spreadsheet and be fed! You can reach me at 651-480-7757 or [bonga028@umn.edu](mailto:bonga028@umn.edu).

## Storing, Drying and Handling Wet Soybeans

Lizabeth Stahl and Bill Wilcke

Soybean moisture levels of 16 to 20% or more at harvest have been reported throughout the state as this challenging harvest season continues. If storage temperatures are below about 60°F, soybeans at 13% moisture can usually be kept for about six months without having mold problems. At higher moisture contents, how long can soybeans be stored before mold becomes a concern?

Bill Wilcke, Extension Engineer with the University of Minnesota, reports that as a guideline, soybeans in storage tend to act about the same as corn that is 2% greater in moisture content. For example, 16% moisture soybeans could be expected to act like corn at 18% moisture.

The following table was developed for corn, so to adjust for soybeans, simply look at the column for a moisture content 2 percentage points greater than

the content of the soybeans in question. For example, 18% moisture soybeans (see the column for 20% corn) at a temperature of 50°F could be stored for about 63 days before there would be enough mold growth to cause price discounts or feeding problems. The allowable storage time is reduced to 28 days at 60°F and extended to 142 days at 40°F. Note that aeration is always recommended with all storage facilities.

Artificial drying of soybeans will be needed if soybeans are harvested and stored at moisture contents greater than 13%. The article, "Soybean Drying, Handling, and Storage," by Bill Wilcke, Vance Morey and Ken Hellevang discusses options and guidelines and is recommended reading if you need to dry soybeans. It includes information on natural-air drying, low-temperature drying, and high-temperature drying. A very condensed summary follows. Another

Corn temperature (°F)	Moisture content (% wet basis)					
	16%	18%	20%	22%	24%	26%
	-----days-----					
20	3820	1459	722	427	587	212
30	1700	648	321	190	127	94
40	756	288	142	84	56	41
50	336	128	63	37	25	18
60	149	57	28	16	11	8
70	83	31	16	9	6	5

**Table 1.** Allowable storage time (days) for shelled corn at various temperatures and moisture contents (approximate number of days corn can be held before enough mold growth causes price discounts or feeding problems).

Reprinted from Natural Air Corn Drying in the Upper Midwest, William Wilcke and R. Vance Morey, WW-6577-GO, 1995. <http://www.extension.umn.edu/distribution/cropsystems/DC6577.html>.

Extension bulletin, "Natural-Air Corn Drying in the Upper Midwest" by Bill Wilcke and Vance Morey, is also useful since many of the principles for drying corn will be similar for drying soybeans.

### Soybean Drying Methods

(*excerpts from Storing, Drying and Handling Soybeans and NDSU Offers Soybean Drying, Storage Advice*)

#### Natural-air drying

Natural-air drying usually works well for soybeans above 13% moisture, but it is slow (two to six weeks depending on conditions) and the amount of drying that will occur in November is limited. Ken Hellevang, an agricultural engineer with the North Dakota State University Extension, notes that at 40°, soybeans at 18% moisture would be expected to dry in about 70 days using an airflow rate of 1 cubic foot per minute per bushel (cfm/bu). At this rate, only about one-half of the soybeans would be expected to dry by the end of November, when outdoor temperatures become too cold to dry efficiently. He then recommends cooling the soybeans to 20–30°F for winter storage and completing drying in the spring when average outdoor temperatures climb above freezing.

In southern Minnesota, an airflow rate of 1 cfm/bu to dry 17 to 18% moisture soybeans is generally recommended for natural-air drying. Use 0.75 cfm/bu for 15 to 17% moisture beans and 0.5 cfm/bu for 13 to 15% beans.

Increasing the airflow rate will increase the drying speed. However, the fan horsepower required to achieve the higher airflow rate becomes excessive unless the grain depth is very shallow. For a soybean depth of 22 feet, the rule of thumb is that each 1,000 bushels will need fan horsepower of about 1. Achieving an airflow rate of 1.5 cfm/bu will require about 2.5 horsepower and an airflow rate of 2 cfm/bu will need about 5 horsepower.

Since the type of fan greatly affects the airflow provided per horsepower, the software developed by the University of Minnesota, FANS: Fan Selection for Grain Bins, can be helpful.

#### Low-temperature drying

Adding supplemental heat to natural-air drying bins is an option for drying wet soybeans. Extension engineers

recommend raising the air temperature no more than 3 to 5°F to avoid overdrying the beans and causing an increase in splits. Research has shown that exposing soybeans to relative humidity values of less than 40% can cause excessive splitting. Since relative humidity is roughly cut in half for every 20 degree increase in temperature, it doesn't take much heat to produce relative humidity values less than 40%.

#### High-temperature drying

Soybeans can be dried in a high-temperature dryer, but be careful. Soybeans split easily if they are dried too fast or handled too roughly, so the plenum temperature needs to be limited to minimize damage. Typically, the maximum drying temperature for nonfood soybeans is about 130°, but even at that temperature, some damage occurs. One study found that 50 to 90% of soybean skins were cracked and 20 to 70% of the beans were cracked at a dryer temperature of 130°.

As noted above, relative humidity values drop rapidly with increased air temperature, so soybean damage with high-temperature drying is a concern. In a separate study, 30% of seed coats were cracked if the drying air relative humidity was 30% and damage increased to 50% of the skins and 8% of the beans at a lower humidity of 20%. Soybeans will need to be monitored closely to regulate plenum temperature and minimize damage.

High-temperature drying may be an option for non-food soybeans, but food soybeans and seed beans must not have damage to the seed coat. For these soybeans, natural-air or low-temperature drying are the preferred drying methods.

