



Rice Notes

University of California ~ Cooperative Extension

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Starting on Page 2 are a few points to keep in mind

when drying your rice in bins this fall. The information is taken from the annual Rice Quality Workshop.

-  *Clean before drying*
-  *Fill depth*
-  *Fan operation*
-  *Stirrers*
-  *Supplemental heat*
-  *Final moisture*

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SABBATICAL LEAVE

I will be on sabbatical leave from November 1, 2006 until May 1, 2007. Typically these leaves are 12 months in length. However due to CE staffing vacancies I will be taking my leave in 2 six-month segments to avoid being short handed during the 2007 growing season.

The second half of my leave will begin in the spring of 2008. By that time the rice farm advisor position in Sutter/Yuba Counties will be filled. That position is currently under recruitment. During my absence Dr. Chris Greer, UCCE Colusa County, has agreed to answer any rice related questions that you may have. His office number is 530-458-0578. His newsletters and meeting announcements will be mailed to you from our local CE office. The winter rice meetings will be held as usual. If you have any questions, please give me call (530-538-7201).

Take care, Cass.

BIN DRYING

Jim Thompson and Cass Mutters, UCCE

Bin drying is slow, but in most years a well-designed and well-operated bin dryer can finish rice drying before the cold months of late fall. The drying time is controlled by the amount of airflow through the rice. As a rule of thumb – doubling the airflow rate per unit of rice will reduce drying time by half. The main goal of bin drying is to move as much air through the rice as possible. This is done by providing adequate airflow capacity, cleaning rice, managing rice depth, and using supplemental heat during periods of high humidity. If properly managed, this method produces excellent rice quality.

Successful operation of bin dryers requires: 1) a calibrated rice moisture meter, 2) a high quality relative humidity indicator and a means to calibrate it, and 3) a high quality electronic thermometer. These instruments guide the operator in making decisions on how deep to fill the rice and when to operate fans.

◆ **CLEAN BEFORE DRYING.** The first step in bin drying is to put all green rice through a high efficiency aspirator and scalper before loading rice into the bin. Fines reduce the airflow through rice, causing increased drying time and fines can cause wet spots if they are concentrated in a small volume. Grain spreaders reduce the build up of fines in the center of a bin, immediately under the spreader.

◆ **FILL DEPTH.** Rice moisture content limits the filling depth for a bin. High moisture rice requires high airflow rates to dry it before damage occurs. For example, rice at 26% moisture needs at least 4 cfm/cwt. As rice depth decreases, airflow increases and Table 1 shows the maximum fill depth for typical moistures.

◆ **FAN OPERATION.** The first goal in bin drying is to cool the rice. Fans should be operated continuously until air leaving the rice has cooled to a constant low temperature. It will be a few degrees above the wet bulb temperature of the ambient air. Fans (without heaters) should remain on even on nights with high humidity until the rice cools. This is particularly necessary if rice has moisture content above 22% and is warm from heat generated by biological activity while stored in the harvester, bankout wagon, or truck. After the rice is cool operate fans when outside relative humidity is low enough to produce drying. Bin discharge air (with the fan on) should be tested regularly for off odors and warm temperatures, especially at start up in the morning and at shut off at night. Off-odors indicate mold growth caused by slow drying. If odors are detected increase airflow by transferring rice, reducing its depth or operating stirrers. Operate burners to keep fans on during high relative humidity conditions. A batch of moldy rice may need to be separated from unaffected product to prevent it from down grading the entire lot because of off-odor.

◆ **STIRRERS.** Fill the bin to a depth of at least 2-3 feet so stirrers operate without whipping. Stirrers fluff the rice enough to increase airflow. A gauge measuring pressure in the air plenum under the rice can be used to determine when to stop the stirrers. Turn off the stirrers when air pressure reaches a minimum level. Do not put high moisture rice on top of dry rice with stirrers in operation. Mixing undried rice from the field with rice below 18% can cause reduced head rice quality.

◆ **SUPPLEMENTAL HEAT.** Burners can be used to add heat to the drying air, allowing drying to continue during periods of high humidity. But heat is not a substitute for inadequate airflow and does not speed drying other than increasing the hours of fan operation. In fact if heat is added to the drying air when outside air already has a low humidity, it will cause bottom rice to over dry. Gas burners should raise drying air temperature by no more than 10° to 15°F. When heat is used, test air temperature rise through fan and burner. Measure the air temperature in the shade (away from burner flame). To measure heated air temperature, drill a hole in the duct between the burner and the bin. Fit the hole with a plug so it can be removed when taking temperature

measurements. Maintain temperature rise at a constant 10-15°F. This may require adjusting the gas pressure regulator, changing the burner orifice or replacing the burner. If drying capacity is limiting harvesting operations, drying air temperatures can be increased by more than 10-15°F if outside air temperature is less than 70°F, but do not exceed maximum daytime temperature of 85°F, whichever is lower, except if it is raining or foggy. Then maintain a 10-15°F temperature rise up to 85°F and hold. Watch for condensation forming on an underside of roof, roof supports, and inside exterior walls. If this occurs, reduce temperature rise until condensation stops.

◆ **FINAL MOISTURE.** Dry to 13.5 -14% moisture for safe storage as indicated in table 8.1 in the rice storage chapter. Rice may be stored through the winter at 15 to 16% moisture if rice is properly aerated and the rice temperature is kept below 50°F. This is not recommended, but may be necessary for late harvested rice. If rice has been over dried, its moisture can be increased by operating fans when outside humidity is high. Table 3 describes the humidity levels that will add moisture without damaging rice.

Table 1. Typical fill depths for bin drying rice

Moisture Content % Wet Basis	Depth of Rice	
	Feet	Meters
Below 18	Up to 20"	6.1
18-20	10'	3.0
20-22	8'	2.4
22-24	6'	1.8
24-26	5'	1.5
26-28	4'	1.2
28-30	3'	0.9

Table 2. Minimum airflow rate for bin drying of rice in California.

Rice moisture entering bin (%)	Minimum airflow (cfm/cwt)
26	4.0
24	3.5
22	3.0
20	2.5
18 or lower	2.0

Table 3. Outside air conditions for fan operation during drying and storage.

Outside air T	Rice MC %	OUTSIDE AIR RELATIVE HUMIDITY %		
		DRY Turn on fan below	AERATE ¹ Turn on fan between	ADD MC Turn on fan between
40°F	Over 20%	93	57 - 66	66 - 92
	19 - 20%	92		
	18 - 19%	87		
	17 - 18%	83		
	16 - 17%	78		
	15 - 16%	73		
	14 - 15%	67		
	13 - 14%			
	12 - 13%			
	11 - 12%			
10 - 11%		55 - 85		
9 - 10%		50 - 78		
		38 - 71		
		27 - 64		
50°F	Over 20%	94	61 - 69	69 - 92
	19 - 20%	93		
	18 - 19%	90		
	17 - 18%	86		
	16 - 17%	82		
	15 - 16%	76		
	14 - 15%	70		
	13 - 14%	61		
	12 - 13%			
	11 - 12%			
10 - 11%		63 - 85		
9 - 10%		53 - 78		
		43 - 71		
		33 - 64		
60°F	Over 20%	95	64 - 72	72 - 92
	19 - 20%	94		
	18 - 19%	91		
	17 - 19%	88		
	16 - 17%	83		
	15 - 16%	78		
	14 - 15%	72		
	13 - 14%	64		
	12 - 13%			
	11 - 12%			
10 - 11%		64 - 85		
9 - 10%		56 - 78		
		48 - 71		
		37 - 64		
70°F	Over 20%	96	67 - 73	73 - 92
	19 - 20%	94		
	18 - 19%	92		
	17 - 18%	88		
	16 - 17%	84		
	15 - 16%	80		
	14 - 15%	73		
	13 - 14%	67		
	12 - 13%			
	11 - 12%			
10 - 11%		67 - 85		
9 - 10%		60 - 78		
		50 - 71		
		40 - 64		
80°F	Over 20%	97	do not aerate at high air temperature	75 - 92
	19 - 20%	95		
	18 - 19%	92		
	17 - 18%	89		
	16 - 17%	84		
	15 - 16%	81		
	14 - 15%	75		
	13 - 14%	69		
	12 - 13%			
	11 - 12%			
10 - 11%		68 - 85		
9 - 10%		64 - 78		
		55 - 71		
		44 - 64		

¹ This range can be safely expanded by 3% below and above if needed for short-term aeration. If hot spots are a problem fans and stirrers should be operated to cool rice and break up hot spots.