

Problems of Grain Drying¹

By Rae H. Harris²

Handling of high moisture grain is a problem of considerable importance in Canada and North Dakota in 1950-51, and has caused much concern to farmers, grain buyers, millers, etc. High moisture content markedly increases the hazards of storage because the activity of micro-organisms, danger of heating, and consequent spoilage are greatly augmented. The excess moisture must be removed before milling, usually by drying with heat to a moisture content in the neighborhood of 13.5 percent. The wheat can then be tempered and prepared for milling at the correct moisture level for best milling results. Wheat that is too high in moisture content for satisfactory milling cannot be stored unless dried without undergoing further deterioration.

Western Canada experienced one of the wettest falls on record in 1950, and enormous quantities of grain are now being dried in terminal elevators. Some notes on procedures followed by our northern neighbors may be of interest to United States readers.

All drying of grain in Canadian terminal elevators is controlled by the Board of Grain Commissioners. Drying operations are supervised by the board's inspection branch. Tough or damp grain that has been properly dried maintains the same straight grade after drying. When injury occurs during drying, a relatively infrequent occurrence, the grain is graded "dried" to its original grade and sells at a discount.

The inspection branch has the assistance of the Board's grain research laboratory in assessing possible injury during drying. Samples of the tough or damp grain are air-dried at room temperature and compared with samples taken after drying. Milling and baking tests, or extensograph tests, are used to detect changes in the quality of the wheat. The extensograph measures changes which take place in properties of the dough during fermentation, and apparently this test is quite sensitive to damage to the wheat gluten caused by improper drying.

The board's regulations require that the temperature of the air used for drying shall not exceed 180° Fahrenheit for any grain except malting barley for which the maximum air temperature is 110° Fahrenheit. Wheat must not be dried below 13.5 percent moisture, and similar levels are set for other grains. Most elevators, when starting to dry grain in the fall, find it advisable to hold the air temperature 10° to 15° below the maximum. If laboratory tests show that the grain is dried without injury, higher temperatures are gradually introduced until the maximum is reached. Some elevator operators find that the highest temperature at which grain can be safely dried in their plants is 5° or 10° below the permitted maximum.

¹Portions of this article relating to grain drying in Canada were prepared by T. R. Aitken, Chemist, Grain Research Laboratory, Winnipeg, Canada.

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The Board of Grain Commissioners' regulations for the drying of wheat are based on exhaustive investigations made about 25 years ago by the National Research Council of Canada in cooperation with the Board's Laboratory. The results of these studies were published in the National Research Council's Report No. 24 (1929) entitled, "The Drying of Wheat." Subsequent practical experience has served to confirm the recommendations made in the report.

Total grain drying capacity in Canada, at the Lakehead, Vancouver, and certain interior points, is estimated at about 960,000 bushels per day. In most years only a small proportion of the total capacity is required to handle tough and damp grain. But in wet falls, and 1950 was certainly in this class, all driers may be in operation round the clock.

The results obtained with Canadian grain should be applicable to North Dakota conditions, and so the air used in drying should be kept below 180° Fahrenheit, except for malting barley, where it should be 110° Fahrenheit. Lower limit of the dry grain moisture should be 13.5 percent.

Durum wheat drying should be done in the same manner as hard red spring wheat, and no damage to quality then would be expected. The color should not be expected to be equal to that of normal dry grain because the color would be impaired by the exposure of the grain to damp weather in the field, and drying would not restore or improve it.

SOME POPULATION FIGURES

Source: 1948 BRITANNICA BOOK OF THE YEAR—BASED UPON LATEST OFFICIAL ESTIMATES FROM EACH COUNTRY.

	People	Persons per square mile
World	2,247,361,000	42.8*
North America	204,783,000	21.8
South America	102,760,000	15.0
Africa	169,777,000	14.6
Australia and Oceania	11,693,000	3.5
Europe (exclusive of USSR)	380,322,000	199.3
Asia (exclusive of USSR)	1,185,126,000	107.2
USSR (in both Europe and Asia)	192,900,000	22.8
1947 area, 1945 pop. est.		

*The area of Antarctica, wholly unpopulated, was omitted in this calculation. Alongside these world figures note the following U. S. figures:

United States	144,708,000	47.9
United States Possessions	2,334,000	
North Dakota		
1940 census—rural	510,012	
1940 census—urban	131,923	
1940 census—total	641,935	
July 1, 1944 estimate—total	528,071	7.5**

**Based upon a land area of 70,054 sq. miles.