

DEMONSTRATION OF ELECTRONIC MONITORING AND MANAGEMENT OF STORED GRAIN

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In 1978, the grain industry in southeast Idaho requested assistance in determining the causes and in finding solutions to grain quality losses in farm-stored grain. The area had established a reputation for producing grain with quality problems and an automatic discount of several cents per bushel was common.

A series of meetings were held in various locations in the state. Elevator operators, company fieldmen, growers and university personnel were involved. Technical presentations were combined with general discussions on various aspects of grain storage.

As a result of these meetings, a research-documentation study was established in the summer of 1979 to determine the extent and kind of quality problems of farm stored grain. Solutions to the problems were also to be researched. A literature survey indicated that storage loss documentation was not available for the states of Utah, Idaho and Washington. The literature review also indicated that aeration could potentially alleviate some of the quality problems if specific kinds of deterioration could be documented (Christensen, 1974; Roberts, 1960; Sinha and Muir, 1973; Converse et al., 1977; Noyes, 1971).

For three storage seasons, thirty farmer-operated bins were monitored. Grain samples of 140 g were taken at twenty-day intervals and analyzed for moisture, insects, and germination. Additionally, three pairs of upright steel bins were instrumented to gather more detailed information. One bin of each pair was established as a control while the other bin was subjected to temperature management. Instrumentation included electronic monitoring of grain temperatures, fan operating time and ambient air conditions. Aeration systems and thermostatic fan controls were utilized to cool stored grain to 16°C or less by Nov. 1. Moisture, insects, mold and germination were monitored at ten-day intervals.

Results of the research-documentation study indicated most storage problems were associated with the advent of increased farm storage and newer, larger farm bins.

Weather conditions in southern Idaho tend to produce very dry, warm grain at harvest time. Moisture content of grain going into storage ranged from 8.5% to 11.5% (wet weight basis) and 21 to 35°C. Storage time or aeration time did not influence average grain moisture. No quality losses were detected in aerated, instrumented bins. Losses frequently occurred in control and survey bins from excessive grain moisture due to moisture migration.

Grain at harvest time had 98% or greater germination over the three years. However, by January, germination levels as low as 10% were recorded from survey bins in two out of three years. No loss in germination occurred in any of the aerated bins which were cooled to maintain temperatures below 16°C. Germination is an important economic factor in Idaho because of considerable malting barley and seed grain production.

Red flour beetles (Tribolium castaneum Herbst) were the most common insect found, comprising 60% of the total population; saw-toothed grain beetles (Oryzaephilus surinamensis Linnaeus) were 28% and lesser grain borers (Rhyzopertha dominica Fabricius) were 4%. No weevils were found during the study. These results are similar to those found by Harien (1980). Sanitizing of bins alone did not significantly reduce insect infestations. Infestations were found in new bins in remote locations. A survey of grain handling equipment tended to rule out insect introduction by contamination.

It was concluded that if farm stored grain was managed properly, under eastern Idaho climatic conditions, most if not all storage losses could be alleviated.

Less than 10% of grain bins on eastern Idaho farms were equipped with aeration systems. Those that were equipped, were not generally operated with management objectives. Very few grower-operators understood the role of temperature and moisture migration in quality losses and insect infestation in stored grain.

A program was implemented by the University of Idaho Extension Service in 1983 to demonstrate proper grain storage management techniques. Major funding was secured from federal pest management sources. Additional support was received from Anheuser-Busch malting barley growers. The Idaho Wheat Commission, Idaho Feed Grain dealers, and county wheat growers organizations provided written indications of support. The program was coordinated by a committee comprised of the district extension supervisor, research agricultural engineer, area entomologist and four county extension staff. Extension staff were designated site leaders with responsibilities for demonstration bins in their particular counties.

Six bins located in four counties were equipped with electronic temperature sensors, digital read-out boxes, aeration systems and automatic controls. Bins were demonstrated on an individual basis and on organized tours. Literature was developed for explaining management techniques for stored grain. Video tapes were also developed for use in county offices and at commodity meetings.

References

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